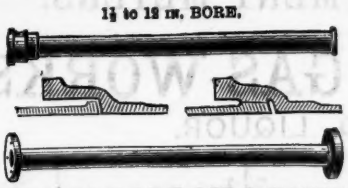
# THE JOURNAL OF GAS LIGHTING
## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXI. No. 1562.] LONDON, APRIL 18, 1893. [45TH YEAR. PRICE 6d.



**GAS AND WATER PIPES**

1¼ to 12 IN. BORE.



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ALSO MANUFACTURERS OF

SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

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INCANDESCENT GAS-LIGHT SYSTEM.

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Gives a light of

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Brilliant Light.

Perfectly Steady and

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Can be attached to any Gas-Fittings.

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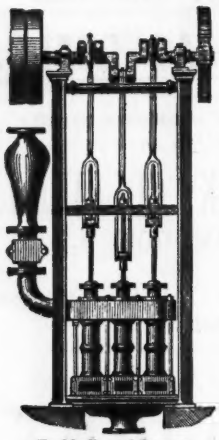

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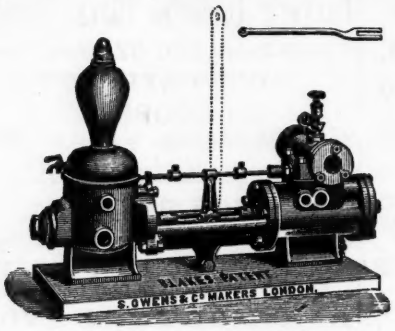

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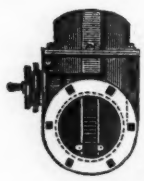

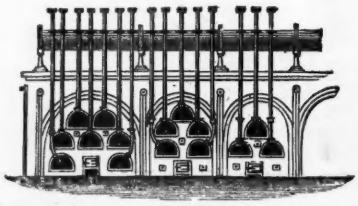

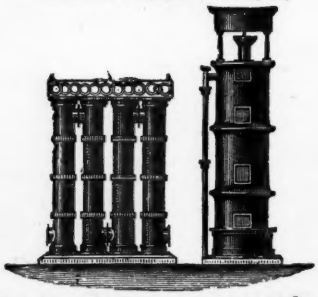

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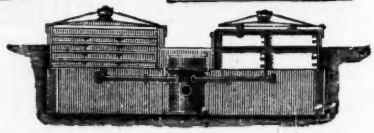

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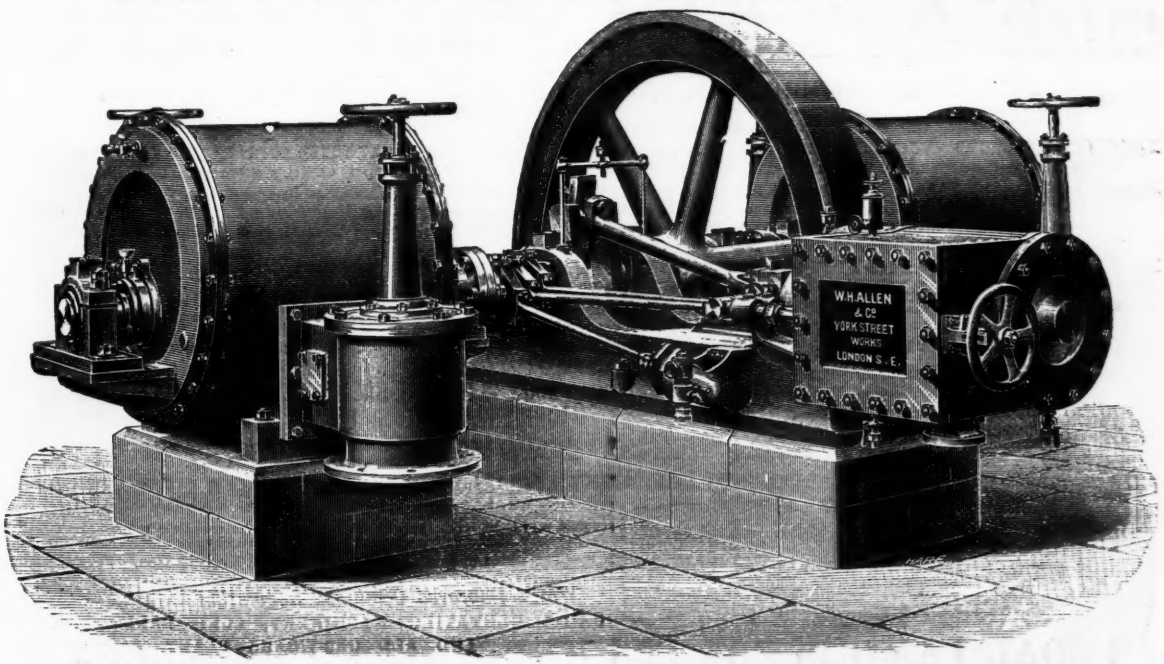


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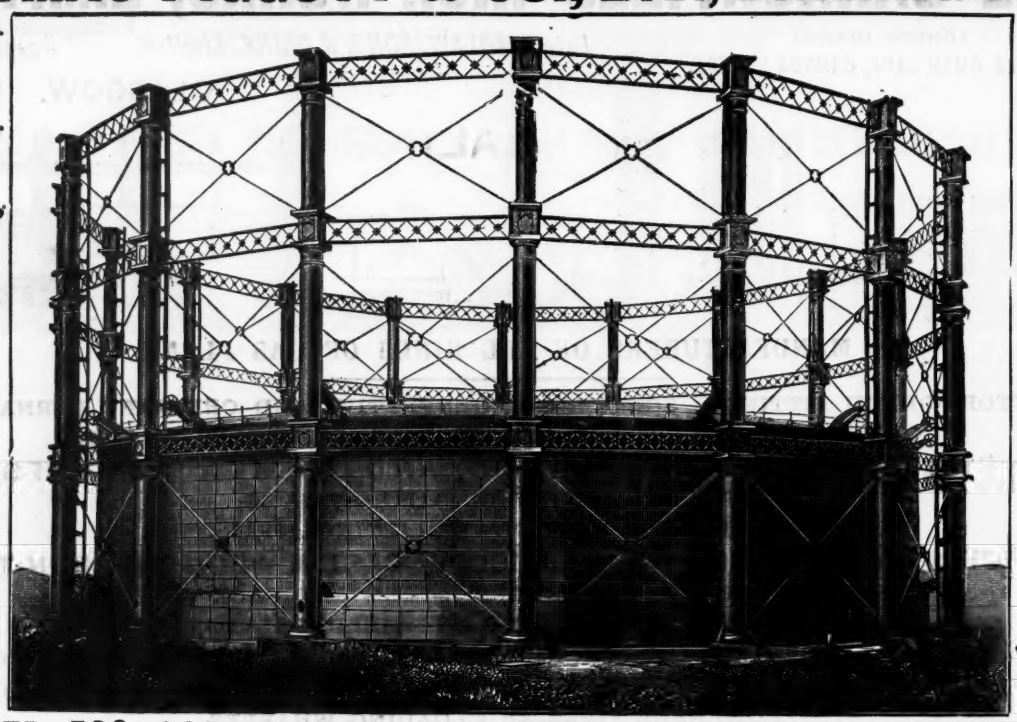

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MANUFACTURERS OF

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OVER **240** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

*Advantages attending its use are:—*

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**POWER CHARGING AND DRAWING MACHINES, driven by COMPRESSED AIR, STEAM, or ROPE.** The power machines are applicable to circular, oval, or ∩-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

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secure a very tight joint; and at the same time the eccentric motion given to the Lid effectually removes the Tar from the surfaces of the Joint.

N.B.—The whole of these Fittings are made of Wrought Iron. Several Thousands in use.

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**OXIDE ELEVATING MACHINERY, COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT, &c.**

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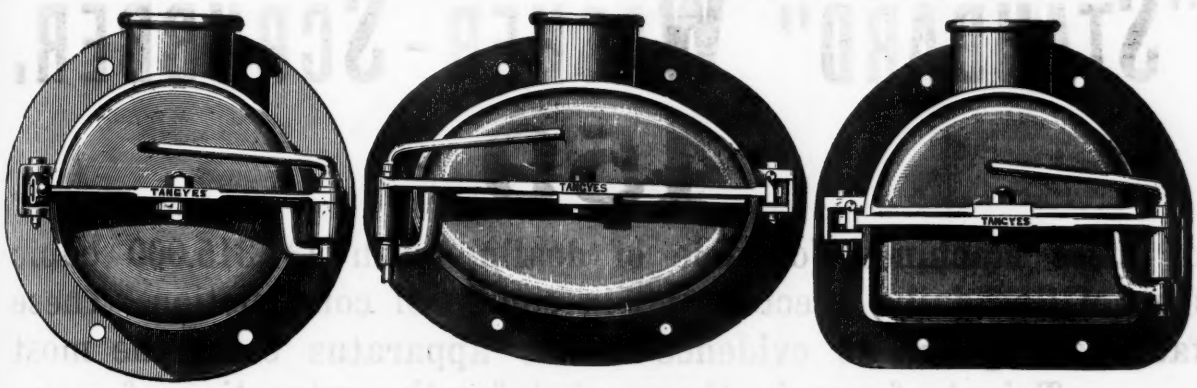
**With Holman's Anti-Friction Catch, Self-Sustaining Cross-Bar, and Improved Eccentric Bolt.**




These Retort Lids and Fastenings are made in three forms, round, oval, and ⌂ (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these Lids are recommended to make their selection, in order to avoid cost of pattern-making, delays, &c., &c.

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LIST OF PATTERNS ON APPLICATION.

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LIMITED.

(SIDNEY HERSEY, Managing Director.) (J. CHANDLER, Engineer.)

## PATENT

# "STANDARD" WASHER-SCRUBBER.

## 459

**of these Machines (capable of dealing with 437,315,000 cubic feet of Gas daily) erected and in course of construction. These facts are given as evidence of the apparatus being the most efficient of any in the market for the extraction of**

**AMMONIA, CARBONIC ACID, AND SULPHURETTED HYDROGEN FROM COAL GAS.**

**A large number of the above Machines have been constructed according to the Company's latest Patent, which has also been applied to original pattern Machines at many Works.**

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*The Gaslight and Coke Company,*
*Horseferry Road, Westminster, S.W.,*
*Nov.* 25, 1889.

Messrs. KIRKHAM, HULETT, AND CHANDLER, LTD.,

Gentlemen,

In reply to your inquiry respecting the result of putting Wooden "Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say they have answered admirably for the few months they have been in; and I think them a decided success.

I am, yours truly,
(Signed) G. C. TREWBY.

NOTE.—Orders since received for four 3,500,000 cubic feet per day Machines for Beckton; and two 3,000,000 cubic feet for Kensal Green, also for Patent Improved Wooden "Bundles" for original pattern Patent "Standard" Washer-Scrubbers erected at Beckton, Nine Elms, Shoreditch, Pimlico, and Bromley.

Extract from the JOURNAL OF GAS LIGHTING, &c., for Sept. 27, 1892, referring to the visit of the Members of the Eastern Counties Gas Managers' Association to the Lowestoft Gas-Works—

"Mr. J. Ayris has one of Messrs. Kirkham, Hulett, and Chandler's "Standard" Washer-Scrubbers in operation (capable of dealing with 500,000 cubic feet of gas per 24 hours); and of the working of this machine he spoke very highly."

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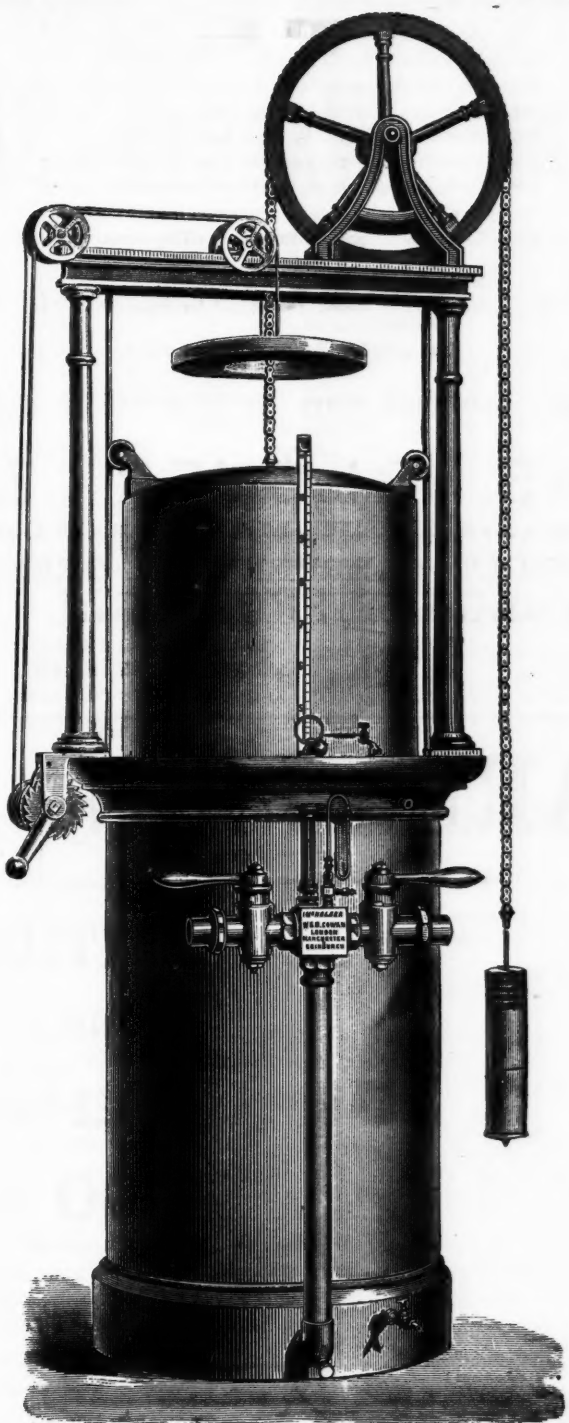
# TESTING GASHOLDERS.

The Cycloid is dispensed with, as being both troublesome and unnecessarily complicated, and far less reliable in action than the compensating counter-balance chain, with which these Testing Gasholders are fitted.



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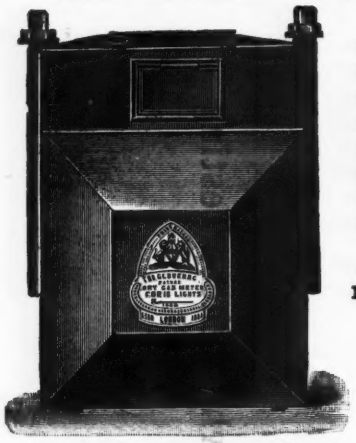
*The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.*



1st.—Are a remedy for all the defects of Wet Meters.
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4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

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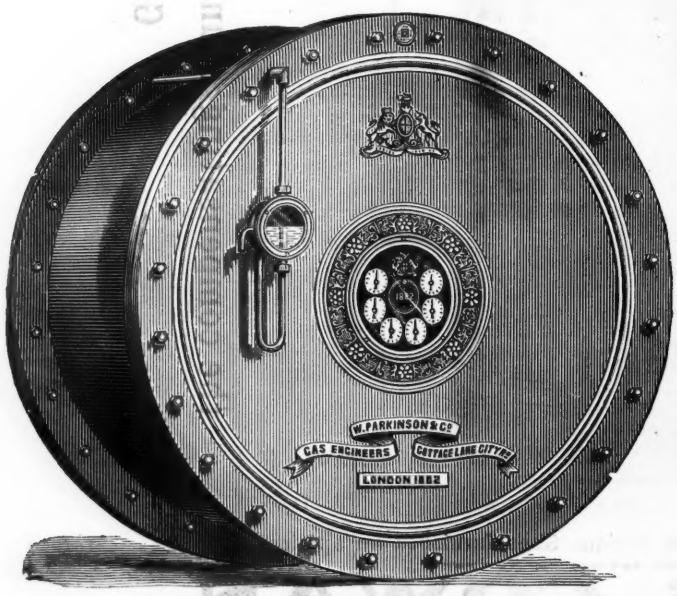


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FITTED WITH PATENT

## THREE-PARTITION DRUMS.

MORE THAN

## 300 STATION METERS,

Varying in size from **1200** to **200,000** cubic feet per hour, have been sold, fitted with

*THREE-PARTITION DRUMS,*

Since their introduction.

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**DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.**

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[See also Advt., p 712.

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## TO CORRESPONDENTS.

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THE

# JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

*TUESDAY, APRIL 18, 1893.*


### The South-Western Association—A Federation Scheme.

It has been observed that there is no place in England like London for work; and, further, that a great deal of the work of London is done by men from the country. The record of the meeting of the South-West of England District Association of Gas Managers at Wormwood Scrubs last Tuesday supplies notable evidence in support of both these statements. Never before in the history of the Association has such a heavy day's programme been set as that which was triumphantly disposed of on this occasion; and few more businesslike gatherings of gas managers have ever been held within the Metropolitan district. There was not a large assembly of members; but those who came must have gone home well satisfied with their day in London. As we have taken previous opportunity for remarking, Wormwood Scrubs is not geographically within the South-Western district; but there was the special reason for holding a meeting of the Association in this place that it has an oil-gas works (devoted to the supply of Great Western Railway trains), of which the President—Mr. E. C. Riley—is the official head; and Mr. Riley wished to show the members over this establishment, and explain on the spot some details of his work as a railway gas engineer. The Inaugural Address was consequently full of "local colour," which renders it an exceptionally interesting composition.

We must be excused for not entering at length into much that was done by the South-Western Gas Managers on this day week, because all the space that can be devoted to noticing their meeting had better be appropriated to bringing into prominence a matter of general interest that was first broached by the President in his address, and was subsequently enlarged upon by Mr. D. Irving, of Bristol. This is nothing less than a suggested Federation of all the Gas Managers' Associations of the United Kingdom. The suggestion is not original in this connection, having been thrown out by Mr. C. C. Carpenter in his recent address to the Southern District Association. Any question of origination would, however, be beside the mark in a discussion upon the idea itself, which is indeed so obvious, and arises so naturally out of a glance over the actual condition of British Gas Managers' Societies, that it may without the slightest exaggeration be described as self-suggesting. What the Committee of the South-Western Association have done in formulating, through their past and actual Presidents, two resolutions framed with the object of giving the idea form and executive force, is merely an act of guidance, not really of creation. Further, in the members of the Association adopting unanimously the two resolutions—"That this Association "approves of the formation of a Federation of the various "District Associations, together with The Gas Institute "and the Institution of Gas Engineers," and "That this "Association cordially invites the several District Associations to appoint two representatives each, and The "Gas Institute and the Institution of Gas Engineers four "representatives each, to meet in conference at a meeting to be called in London in August or September next"—it must be conceded that the Association have taken a perfectly unexceptionable course with the object of ascertaining whether there is any ground upon which a Federation movement might hopefully proceed.

We desire to say at once that, whatever may come of these resolutions, we have the warmest sympathy with the spirit of which they are the product. It is unnecessary to argue on behalf of the advantages of mutual association for the men who are engaged in carrying on the gas industry of this country. That goes without saying; but if evidence in support of such combination were needed, it lies close at hand in the number of Gas Managers' Associations actually existing. These prove the desirability of their own existence; but it is equally true that they are all limited, imperfect, and more or less unsatisfactory. There are a number of Provincial and District Associations of Gas Managers, several overlapping each other. Many active, helpful, and socially-minded engineers find themselves absolutely compelled, in order to keep in touch with their colleagues and neighbours, to pay three or four subscriptions; and even then they feel the friction of too many "wheels within wheels" in the running of these societies. And as to the two so-called national organizations, their existence is notoriously a makeshift device which is not creditable to the industry at large. In short, while professing to exemplify the blessings of unity and concord, the British Gas Managers' Associations really illustrate the evil of discord and irreconcilability among men who should be brothers in council. It is idle to ask who began it, or who must come to whom in order to end it. The ugly fact is that such a deplorable state of things exists. Is Mr. Irving deceived, one wonders, in depending "upon the wisdom and the good sense of the "profession generally to support any scheme that could be "shown to be for the common good of the profession, and "in the interests of the gas industry"?

Although no orator—perhaps for this very reason, and because he has not been identified with any party in controversy—Mr. Irving made out a strong case for the measure he was advocating. Here we may take the opportunity

of reminding all whom it may concern that Mr. Irving, while he said nothing to this effect, should be taken as a representative of the younger order of gas engineers who have nothing of the rancour of past quarrels to prejudice their perceptions of the circumstances of the time. They neither know nor care why Mr. Brown cannot bring himself to row in the same boat with Mr. Black, or why Mr. White holds aloof from both. All they are concerned for is the pitiful frittering away of the strength of the gas interest that comes of splitting up its personality into too many pretentiously distinct groups. When he says that there are "too many meetings," he only utters a truth that every Association Secretary will endorse; and in stating the opinion that the Associations consequently suffer in weight and influence, Mr. Irving only confesses what many others secretly believe. Moreover, who will deny the assertion that there is a "great waste of time, energy, and "money in running rival institutions. Mr. Carpenter is, at any rate, not afraid to admit that "the existing "order of things is quite wrong." There is small doubt that little more than the moral courage that looks facts in the face, and is not ashamed to do what is patently right in face of captious fault-finding, is needed to put an end to the difficulty.

While we wish well to the Federation scheme, however, it is not to be forgotten that there are many difficulties—legal, financial, and personal—in the way of its accomplishment. Though we have put these kinds of hindrances in the order given, it would probably be found that the last should be first. In almost every society there will be discovered a man, or a handful of men, who have undertaken the working of it as a personal hobby; and these will not be easy characters to deal with. The "personal equation" has a great—perhaps an exaggerated—value in such problems as this. The legal difficulties might be circumvented; for knots that lawyers tie can generally by other lawyers be cut or made useless. There only remains the financial question, as to which the solution is clear. If the District Associations undertake to bring about this fusion, they must be prepared to pay for it. Both the national organizations have recently passed through constitutional crises which have taxed their resources to the uttermost; and neither has a penny to spare for further luxuries of the kind. The circumstance that these institutions are not very well off, however, is favourable rather than otherwise to the Federation idea. But if the District Associations want to try a third venture in constitution-making under the supervision of the Board of Trade, they must pay the costs out of their accumulated funds. This is a point that has doubtless already attracted some attention. Before quitting the subject now, we have one last observation to offer, which is that nobody should rush hastily into print with criticisms of the scheme, or reflections on anybody connected with it. Personal feeling has worked so much mischief among gas engineers in the past, and individual susceptibilities are so quickly wounded by careless epistolary expressions, that the greatest caution is required to avoid spoiling this last project of unity before it is fairly launched.

### The Commercial Meeting.

THE general meeting of the Commercial Gas Company was held on Thursday last; and the proceedings, which will be found reported in another column, were of the briefest. The Chairman (Mr. J. Blacket Gill) appears to have accepted the character of lugubriousness which we have had previous occasion to ascribe to him, and this time he fully acted up to it; for if the undertaking had been *in articulo mortis*, he could not have been very much more funereal than he was on Thursday. His speech, in moving the adoption of the report and accounts, was as apologetic as though he were understudying another performer in the same line who shall be nameless; and not even Mr. H. E. Jones, whose "cue" it is to speak up for the Commercial prospects amid all circumstances, could lift the depression that weighed upon the proprietors during the five-and-twenty minutes that had to be lived through before the last customary vote of thanks set the melancholy assembly free. All this is really uncalled for. There is nothing specially wrong about the Commercial Company, even if it is not doing so well as could be desired. The price of coals may rise one year and fall the next, and the value of residuals may fluctuate; but still the proprietors will get their dividend. There has been some murmuring among the consumers, and the demand for gas has shown a temporary check; but is this any reason why the Chairman should despair? If there is a jog-trot gas undertaking anywhere in the kingdom, it is that which has its head-quarters at Stepney; and there is none which goes on its way with less friction. The gas is not dear; and the shareholders get a very comfortable return for their money. What more is there to be desired? Still, their experience during the past few months is not meaningless for the Directors. They have had an illustration of the fact that their business is of a kind that cannot well bear oscillations of price. Farther westward, people may talk of putting on twopences and threepences on the price of gas as though consumers would not notice these little surcharges; but it is not so in the Commercial district. There, every penny tells; and the difference between gas at 2s. 4d. and 2s. 6d. per 1000 cubic feet is keenly appreciated. Mr. Gill held out the hope that the price of gas may be lowered again if times are favourable, which it is to be trusted will be the case. Economy in working, moreover, is a good help to the revenue even of a Metropolitan Gas Company.

### The Tin-Plate Trade in the United States.

SOME time ago, we ventured to make an inquiry as to the effect of the M'Kinley Tariff upon the United States trade in gas-meters, which are principally composed of tin-plates. The inquiry seemed to be pertinent, because it was a leading point of M'Kinleyism to discourage the importation of tin-plate and tin-plate goods into the States, and to create and foster the home manufacture of the article. No information upon this head has been made public, however—a circumstance which gives support to the opinion that nobody greatly cares in the United States whether gas-meters are cheap or dear. So far as the American trade in tin-plate with the United Kingdom is concerned, M'Kinleyism appears to have utterly missed its aim. It was pretended by the manufacturing interest which was most largely instrumental in procuring the last revision of the tariff, that, if a sufficiently high duty were put upon imported tin-plates, quite enough plant would be erected within the twelvemonth to manufacture from native materials all the tin-plate used in the States. The duty was accordingly put on; but the native-made plates failed to appear. Consumers had to pay an enormously higher price for them; but what were called American tin-plates were generally made from imported plates dipped in imported tin. The collapse of the Harney Peak tin-mining scheme completed the *fiasco;* and now, according to the Foreign Office reports, strong efforts are being made to have at least the section of the M'Kinley Act referring to the tin-plate trade repealed, "and so bring to an end," as a contemporary remarks, "an experiment in economics "which has only benefited a small number of manufac-"turers at the expense of a large section of the community." Old-fashioned people, who still believe that there is something in the arguments that induced the last generation of Englishmen to adopt Free Trade, cannot help chuckling when they come across these instances of the blundering of self-styled "go-ahead" communities who think themselves able to despise proved economical principles.

### Industrial Diseases.

MANUFACTURERS in general must sympathize with a protest recently made in the correspondence columns of *Industries* against the sensational way in which writers in certain daily newspapers have lately been working up the subject of "Industrial Diseases and their Prevention." One London newspaper, in particular, has promulgated many highly-coloured statements respecting the condition of the workers in certain chemical industries, which, if they had had any justification in the facts, should have borne immediate fruit in a new and drastic Factory Act. The circumstance that all this lurid literary competition has fallen absolutely flat upon the newspaper-reading public shows, however, that it has no force of truthfulness in it; for nobody, from Howard to Plimsoll, has ever striven in vain to interest the English people in a real grievance. The fact is that an ordinary newspaper man is not qualified to form an opinion upon the arduousness or danger of manufacturing operations to which he is a stranger. As with chemical and iron works, so with coal mining and gas making; a casual on-looker, hailing from the precincts of a newspaper office, "is unduly impressed by operations

"demanding strong physical exertion, or requiring huge "machinery or other appliances threatening injury, or "entailing exposure to very high temperatures, to steam, "noxious gases or fumes, or to the influence of poisonous "materials." It is not too much to say that there is many a factory which, if visited after nightfall, would scare a reporter almost to death; whereas persons who are used to the ways of the place would experience in it no more feeling than would be aroused by walking along the street outside. The prevailing tenor of these sensational newspaper reports on the working conditions in certain industries is that employers are utterly indifferent to the well-being of the men who have to do all these terrible-looking things—draw retorts and the like. The writers seem to "proceed on the assumption that no strong labour "should be permitted, and no unhealthy process tolerated." We must remember, as a writer in *Industries* points out, that "numerous evils cling to employments of all kinds, "and that more or fewer of them are unavoidable." We cannot all get a living as theatrical critics, who are supposed to be supplied gratis with unlimited "chicken "and champagne." It is even probable, however, that the average expectation of life of the critic so sustained is not so good as that of the average gas stoker. The newspaper scribblers make a great to-do over the woes of the Widnes alkali worker; but is he really a greater sufferer than the warehouseman who passes his life inside a building the atmosphere of which is laden with floating woollen fibres? Yet no agitation could be got up about the unwholesomeness of warehouse work. That the "Special "Commissioners" of newspapers are seldom the right persons to discover the truth respecting manufacturing operations and their effects upon those engaged in them, is true; but it is also true that nobody pays much attention to what these clever writers say about matters which they do not understand.

### The Hull Strike.

In concluding our comments last week upon the Hull strike, we expressed the opinion that by this time the miserable business would be over. Practically this is the case, so far as the Hull shipowners' part in it is concerned; for their victory was practically assured some days ago, when it could no longer be doubted that the work of discharging, loading, and despatching vessels was being proceeded with by means of the imported free labour. At the moment of writing, however, Mr. J. H. Wilson and his colleagues are raising a tremendous dust to cover their defeat, in the shape of threats to bring about a "national "strike," with the asserted object of compelling the Shipping Federation to abandon the port of Hull. We anticipated that the agitators would have slunk out of Hull ere now; but how much discrepancy there is between this procedure and the departure of Wilson to "raise the "country" in rear of the Shipping Federation must be left to more skilful dialecticians to say. Meanwhile, it may be observed that the agitators themselves are not of one mind as to how and when the threatened reprisal may be best carried out; and it is tolerably safe to say that the idea will come to nothing. The Unionists fully realize the importance of the emergency; and they are trying desperately to confuse the issue between themselves and the Hull shipowners by accusing the latter of seeking to lower the rate of wages and "demolish the "Union." In this way they are hoodwinking some newspapers, and endeavouring to make out a ground for "compromise." The truth of the matter is, however, that there is no question of wages at stake, nor is there anything to compromise. As *The Times* points out, there can be no middle course between consenting or refusing to work amicably with non-unionists; and when people are bidden to contemplate the tyranny of the employers, it is a sufficient answer to cite the primary cause of the strike, as recounted in these columns last week. When the second state of Hull has been made worse than the first, from the Union point of view, by the swelling of the local labouring force by the numbers of imported men who will remain to compete for the work of the port, and when the impotence of the Union to stop this congestion by creating a counter-irritation elsewhere has been demonstrated, what will become of the Wilson and Tillett organizations? It will be indeed wonderful if the deluded dockers continue to pay for the disastrous services of these eminent strike specialists.

## WATER AND SANITARY AFFAIRS.

The report of the *Lancet* Commission on the Water Supply of Chicago has attracted considerable notice, and, among other matters of moment, contains some features of much interest when viewed in relation to the Water Supply of London. The fact with which we have to start is that Chicago takes its supply of water mainly, though not exclusively, from Lake Michigan. In the next place, nearly 15 per cent. of the sewage of the city flows direct into the lake from certain districts on the shore. The bulk of the remaining 85 per cent. is discharged into the River Chicago, which serves as the main sewer of the city. The natural discharge of the river is into the lake; but, in order to prevent so undesirable a result, a powerful pumping-station has been erected on the banks of the stream, by means of which the river water, or some portion of it, is pumped over a lock into a canal, which carries this contribution far south into the Missouri, and eventually into the Mississippi. A large proportion of the suspended matter is deposited as sludge in the bed of the Chicago River, where it would possibly impede the navigation were it not for the fact that dredging is diligently practised. It would seem almost incredible, were not the thing fully vouched for, that, after taking pains to discharge the diluted sewage of the river into the Missouri and Michigan Canal, the sludge dredged up from the river bed is carried away and thrown into the lake, which we are told thus receives these solid matters in addition to the discharge from the sewers on the shore. Finally, the general supply of water for Chicago is drawn from Lake Michigan by means of half-a-dozen pumps distributed over the city; the water being neither stored nor filtered, but distributed exactly as drawn. Let us imagine London supplied with water taken from the Thames at Hampton, without any subsequent treatment by means of subsiding reservoirs and filter-beds. Further, let us conceive, if we can, that, after the Metropolitan sewage had been sent down to Barking and Crossness by a costly system of interception, a portion of the sludge deposited in the settling-tanks was conveyed in barges up the river, and discharged into the stream somewhere about Staines. We must also imagine sundry small towns on the banks of the Thames sending their crude sewage direct into the stream. Granting that there may be a little exaggeration in the picture, still the principle is the same in each case; and we ask how the people of London would like to take their water supply under such conditions, or upon conditions at all approaching such a state of things. What would be said if the zymotic mortality of the Metropolis were like that of the American city, concerning which we are told that "Chicago suffered from typhoid fever nearly "eight times as much as London in 1890, and nearly "twelve times as much as London in 1891." It may be argued that the fever was caused by a polluted atmosphere, or by injury done to the supply in the process of cooling by means of impure ice. But water that is obviously open to suspicion must clearly be taken into account when typhoid fever is largely present; causing in one year more than 400 deaths in a population of 1,500,000.

We now come to a very curious part of the subject—one which at first sight appears anomalous, and yet on further consideration proves instructive. The report states as "a surprising fact" that samples of water "taken from "the lake over the dumping-grounds was of a quality, "save for its suspended matter, superior to that of the "ordinary London Water Supply." That is to say, the percentage of dissolved matter of organic origin was less than in the London waters. So much for the matter in solution. As for the suspended matter, it is explained that this could all be removed by effective filtration. Hence the *Lancet* Commissioners "most cordially and with "the liveliest satisfaction" congratulate the people of Chicago on the possession of an illimitable water supply, "which needs nothing but good management to render it "all that could be desired." This "good management" consists in having the water properly filtered, so as to get rid of the suspended matter. But how is it that the sole trouble is of this limited character? The Commissioners in their report say: "The lake, at the time our "samples were drawn, was free from chemical evidence "of sewage pollution to an extent that, regard being "had to the amount of sewage which in one form "or another it receives, is surprising." But do we

not find in this instance a striking proof of what has been often asserted, and nearly as often denied, as to the self-purifying power of running water? To what extent Lake Michigan is subject to currents, we are not informed; but its volume is great, and its contents must be more or less in motion. Some process of natural purification must be operating, or chemical analysis would never show the favourable results which the *Lancet* records. On the other hand, the suspended matter is open to grave objection; so much so that, in the absence of filtration, the water is declared "quite unfit for drinking." The keepers of hotels and restaurants in Chicago seem to know this; it being their general practice to eliminate the suspended matters by means of Pasteur filters. That this plan is adopted by all who drink the Michigan water is more than may be expected. Yet we are told "the security of Chicago "against a serious outbreak of epidemic disease depends "entirely on the care with which the water is purified "before use by means of domestic filters." The practical conclusion arrived at is conveyed in the following words: "With proper and efficient filtration there is "nothing, so far as its chemistry goes, to suggest "that the water supplied to Chicago from Lake Michi-"gan is not well suited for all domestic and dietetic pur-"poses." Considering what goes into the lake, how "the "very worst refuse is thrown into its midst," so as to come within range of its subterranean aqueducts extending under the bottom of the lake, considering also how the Chicago River discharges its contaminated water into the lake during seasons of flood, it is encouraging to know that nothing but filtration is wanted to render the water perfectly safe for drinking purposes. The London Water Supply is taken from sources carefully guarded against pollution, it has time to settle in subsiding reservoirs, and it is filtered after a manner which excludes not only suspended matter, but almost the whole of the bacteria, so that in many cases the river supply will compare with that obtained from deep wells. The lesson learned at Chicago is one that redounds to the credit of the London Water Supply, and shows how much is tolerated abroad which would never be endured at home.

**Retirement of Mr. J. Orwell Phillips.**—It is with sincere regret that we have to announce the resignation by Mr. J. O. Phillips, on the ground of ill-health, of the offices of Secretary and General Manager of The Gaslight and Coke Company. The intimation was conveyed to the Court of Directors on Friday; and we understand that it is the intention of the Court to mark their sense of Mr. Phillips's long and brilliant service by granting him a substantial retiring allowance. Though Mr. Phillips is at present in London, he contemplates leaving town again almost immediately, with a view to a prolongation of the rest from which he has already greatly benefited. No formal change is likely to take place at Horseferry Road before Midsummer.

**Hot-Blast Stoves.**—The well-known hot-blast stove of Mr. E. A. Cowper was described by the inventor to the London Section of the Society of Chemical Industry at the April meeting. Perforated fire-bricks, closely packed in a high tower, are raised to incandescence by the downward passage of a producer flame; the gas-inlet is then closed, and air or other gas forced up through the hot bricks. Air so heated is largely used for blast-furnaces, for which the most suitable temperature is 1500° to 2000° Fahr. The stoves find a more immediate application to chemical industries in the means they afford for the direct heating of material under process of distillation or evaporation; but they have been applied to the distillation of tar and petroleum.

**The Connolly Petroleum Motor for Tramcars.**—At the meeting of the Tramways Institute of Great Britain and Ireland in Birmingham towards the close of last year, the President (Mr. W. J. Carruthers-Wain) referred to the use of gas and oil motors for tramcar traction; and, in the course of his remarks, he alluded specially to the Connolly oil-engine, which he said was being tried on the Greenwich line. This engine, which has been in use for some time in America, is fixed in a small car. It has a pair of overhead cylinders driving a crank-shaft, and is capable of developing 12-horse power. The oil is stored in a cylindrical tank placed within another cylinder, and carried above the engine. The ignition of the charge of vapour is effected by electricity; there being a small dynamo in the car in which the engine is mounted. The dynamo is driven by a strap from the engine; and the current is stored in an accumulator used for igniting the charge, as well as for lighting the car at night. From a return of seven days' working—fourteen hours per day—it appears that 350 trips were made, covering 507·85 miles, and carrying 4182 passengers, with a total consumption of 70 gallons of oil.

# ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 700.)

The long-desired improvement in the Stock Markets, which it was hoped was inaugurated with the resumption of business after Easter, has met with an early check through the events of the past week. The failure of another Australian Bank shows that we have not reached the bottom of the mischief to be apprehended in that quarter. Then the *coup d'état* in Servia, howsoever ludicrous its incidents (to music by Offenbach what an *opera-bouffe* it might have been made!), is a most unsettling event; for it is never safe to disregard the smallest cloud upon the Eastern horizon, as one never knows how big a storm may be brewing behind it. The money matters in the United States have not been cheerful. So that, altogether, the state of things is somewhat depressed. But while the more speculative markets have thus suffered, the higher class of securities have *per contra* been in greater demand; and the result is a considerable advance in prices of Gas issues, the real value of which the public are once again appreciating. The Metropolitan Companies have been in good request. Of the Gaslight issues, the "A" continues to be remarkably steady at the old figures, which it has maintained now for several weeks past—opening and closing at about 223. The secured issues of all kinds have been extremely brisk, and stronger than ever; all the debenture stocks and some of the rest having risen materially. South Metropolitans were quieter; stock being scarce. The "B" has risen 2, and looks like going higher; while sellers of the debenture stock were asking 1 more. Commercial old has advanced 2, and is disposed to rise still higher. At the Company's meeting on Thursday, the Chairman's exposition of the affairs and prospects of the Company appeared to give general satisfaction. The advance in quotation extends to the Suburban and Provincial undertakings; Alliance and Dublin new and Bristol being higher. The Continental Companies have been rather quieter, but equally firm as of late; and Union has made some further upward progress. Cagliari also is 1 higher. None of the rest exhibit any feature, except Buenos Ayres, which is ¼ easier. Water stocks generally are firm; and a few issues show moderate improvements.

The daily operations were: Gas opened somewhat quiet on Monday, except for a brisk demand for debenture and preference issues. Gaslight "K," South Metropolitan "B," and ditto debenture and Continental Union gained 1 each. Business remained rather quite on Tuesday; but prices were very good. Commercial old rose 2; and South Metropolitan "B," 1; but the buying price of the debenture was put back to yesterday's figure. In Water, New River advanced 2; and Southwark, 1. There was more activity in Gas on Wednesday, coupled with some further advances; Continental Union and Cagliari improving 1 each. In Water, Kent and New River rose 1. The secured issues were in most demand on Thursday. Gaslight "H" improved 1; the 4½ per cent. debenture, 2½; and the other two debentures, 1½ each; and Bristol, 1. Friday's transactions were more limited; and quotations underwent no change, except for an *ex div.* improvement in Alliance and Dublin new. Saturday was, of course, a quiet day; but prices marked were very good. All quotations closed without further alteration.

## ELECTRIC LIGHTING MEMORANDA.

**The City of London Electric Lighting Company's Meeting—The Woodhouse and Rawson Liquidation—The Perforation of Gas Mains by Electric Currents.**

The ordinary general meeting of the City of London Electric Lighting Company has been held, and some further particulars relating to the position of the undertaking were given by Sir David L. Salomons, the Chairman. It was stated that up to the present time the supply has been provided by the small "pioneer" stations taken over by the Company; but the permanent "units"—whatever these may be—which have been contracted for by the Laing, Wharton, and Down Syndicate are are shortly to be landed at the Company's works on the Thames. These mysterious appliances have been "made in America;" and this accounts for the delay in their appearance. It will come as an unpleasant surprise to many people that the City of London Electric Lighting Company and their Wolverhampton contractors have been obliged to go to the United States for an essential part of their equipment. The Chairman also said that the Company hope to be in a position by the end of the year to supply 130,000 lamps of 8-candle power. It is in contemplation to try incandescent lamps once more for lighting some of the lesser City streets; but why this extravagance should be entertained does not appear. It should be noted that the Company are preparing to "hedge" in their venture by leasing spare wire conduits to the New Telephone Company, from which they hope to get a certain profit to go towards their general revenue. But, unfortunately for this scheme, the City Commissioners of Sewers are not yet prepared to sanction the arrangement, which they regard as a piece of sharp practice on the part of the Company, whose way-leave did not include any such powers for sub-letting conduits.

A meeting of the debenture-holders and other creditors of Woodhouse and Rawson United, Limited, was held on the 10th inst., to consider what action the creditors, as a whole, should take in view of petitions which have been presented to the Court praying for the compulsory liquidation and winding up of the concern. Sir Rawson W. Rawson and Mr. Pope, Q.C., attended the meeting, and argued in favour of persistence in the course of voluntary liquidation recommended by them, and agreed upon by the recent general meeting of the Company. It was contended that a compulsory winding up, which appears to be desired by some small creditors, would probably result in a heavy loss, even to the secured creditors; while, on the other hand, it is believed by many interested in the Company that a reconstruction scheme (the details of which are at present before Counsel) might be carried through, which would not only pay all the creditors in full, but leave a substantial balance for the shareholders. Although the meeting in the end adopted a resolution affirming the undesirability of a compulsory liquidation, and recommending that Mr. Alexander Young should be retained to act as Voluntary Liquidator under the supervision of the Court, with a view to carrying out a scheme of reconstruction, this agreement was not arrived at without some very unpleasant things having been said about the conduct of the Directors in allowing matters to come to the present pass. Rightly or wrongly, some of the creditors and proprietors regard the prospect held out of anything being saved from the wreck through the process of a voluntary liquidation, as a bait offered by the Directors to induce their victims to permit of their alleged misconduct being hushed up. This prospect of salvage is, indeed, the sole consideration that moves the proprietors to allow the remaining Directors to have their way in the matter of the liquidation. There is a strong desire in some quarters to "show the Directors up;" but the more prudent creditors of the Company feel that there would be little satisfaction in having this exhibition at the cost of what yet exists of the property. The only one of the Directors for whom it is possible to feel much pity is Mr. Pope, who is fighting desperately to save the reputation which some shareholders consider him to have imperilled by a connection which has cost him dear in cash. At the same time, there are not a few irreverent spirits who experience an awful joy in witnessing the spectacle of an eminent Counsel in a position similar to that in which many a layman has found himself, to be handled roughly enough by the lawyers before he has made his escape.

The attention of English electricians has been drawn to American experiences of the effect of earth-currents upon gas and water pipes. We gave last week an abstract of a paper contributed to the New England Association of Gas Managers on this important subject. Our contemporary, the *Electrician*, commenting upon this and other statements of the same category, remarks that the injurious effects in question are due to the absence of an insulated return wire, and does not exhibit surprise that pipes made of different materials were tried in vain while the cause of the mischief remained. Further illustration of injury to gas-pipes by the trolley system of electrical tramway working is supplied to the *American Gaslight Journal* for the 3rd inst., by Mr. John R. Pearson, of a natural gas company supplying Indianapolis, who sends a photograph, reproduced by our American contemporary, of the effect of a short circuit between a street-car standard and the nearest gas main. A large hole was melted in the pipe, from which gas escaped—fortunately into the open air, where it blazed up some 15 feet high. As Mr. Pearson says, the consequences would have been much more serious if the issuing gas had happened to make its way into the basement of any of the houses fronting the street, as it might easily have done. This new street danger will require careful watching all the world over.

**Mr. John F. Lyne**, Assistant Manager of the Wexford Gas-Works, has been appointed Manager and Secretary to the Enniscorthy Gas Company, without competition.

**Institution of Civil Engineers.**—Among the associate members elected at the ordinary meeting of this Institution last Tuesday were Mr. Maurice Graham, Engineer of the Automatic Coal-Gas Retort Company, Limited; and Mr. John Holliday, of the Scarborough Gas-Works. The last-named gentleman was a student of the Institution.

**Presentation to Mr. Martin Peirce.**—At the meeting of the Richmond (Surrey) Town Council last Tuesday, the report of the Water Committee included one by the Borough Engineer, Mr. W. G. Peirce, on the progress of the works at the Terrace Gardens well, which, as already mentioned in the JOURNAL, has lately been successfully connected with the old well and waterworks. In recognition of the services rendered by Mr. Martin Peirce in carrying out the works designed by his father, the Committee submitted an illuminated and framed testimonial, under the corporate seal, recording their appreciation of the ability, diligence, and watchful perseverance displayed by him throughout the undertaking. This testimonial they recommended the Council to present to him, accompanied by an increase of salary. This was agreed to. The Mayor (Mr. C. Burt, J.P.), in communicating to Mr. Peirce the decision of the Council, expressed their good wishes for a continuance of the successful career he had begun.

## THE FIRST FRUITS OF THE LABOUR COMMISSION.

WHILE the old issue between the pretensions of militant Trade Unionism and the freedom of labour is being fought out once more at Hull, it will be seasonable to bring under the notice of JOURNAL readers certain information contained in the first volume of "Foreign Reports" issued in connection with the Royal Commission on Labour. This publication is in the form of a Blue-Book, and is noteworthy as being the first fruits of the labours of the Commission. It has been compiled by Mr. Geoffry Drage, the Secretary, mainly from literature supplied by the Foreign Office through the Legation at Washington; and it deals with the condition of labour in the United States in a manner that gives one a very high opinion of the ability of the compiler. We have no hesitation in stating that the clear way in which Mr. Drage has here marshalled the vast mass of material with which he must have been confronted when he undertook to draw up a report upon the Labour Question in the United States, is the best omen we have yet seen of the prospect of having the result of the labours of the Commission presented to the public in an intelligible form.

The peculiar interest of the present report lies in the fact that the organization of Labour in the United States is understood to be comparatively far advanced. In no part of the world has the idea of combination for trade purposes been so thoroughly carried out. Everybody and everything in the States seems to be organized for the attainment of some particular, not to say selfish benefit. The National Government, by means of the Tariff, attempts to retain all the profits of trade and manufacture inside the country; and the number of industrial societies is legion. Moreover, there is a Federal Department of Labour maintained by Congress; and there are Labour Bureaux in twenty-eight States. If legislation in the supposed interests of labour, and the circulation of official information relating to work and wages, could avail to render workpeople prosperous and contented, these results might be expected to be conspicuously in evidence in the United States. Unfortunately, this is so far from being the case, that American labour troubles are notoriously frequent in their occurrence, and desperate in their character. Why this is so, is one of the things which Mr. Drage sets himself to explain.

He begins by recounting that the relations between employers and employed in the United States have become more bitter of late years, owing to the rapid growth of the factory system and the widening gulf which separates the individual manufacturer from his workmen. Again, the individual employer is reported to be giving place more and more to the joint-stock corporation; and there is an increasing tendency, both amongst corporations and amongst individual employers, to form associations, the members of which are pledged to mutual support in the event of any difficulty with their workmen. This latter result, which has the obvious effect of dividing employers and employed into antagonistic bodies, appears to have been brought about by the action of the men, who began this "plan of campaign" by banding themselves into organizations such as that of the Knights of Labour, whose object was, as described by Professor Walker—himself a friend to Trades Unions—"to institute a hideous and intolerable tyranny, which would be worse by far than the tyranny which would result from unrestrained power on the part of the master class." There is naturally a general refusal on the part of employers to recognize these organizations, even when they do not actively discountenance them.

It is complained that in some trades, such as anthracite coal mining in Pennsylvania, the masters' associations have "bettered the instruction" they derived in the first place from the organized workmen, and have reduced their workpeople to complete dependency by insisting upon the "truck system" and other devices now illegal in this country. On the other hand, it is admitted by some American public men that, where employers combine for the sole purpose of protecting their own interests, their action may be beneficial in furthering that regulation of production the advantage of which is so firmly believed in by the Protectionist party. It is admittedly difficult, however, for employers, whether organized or not, to carry on business under the domination of the Trades Unions. The most effective, and irritating, instruments in the hands of the Unions are "shop committees" and "walking delegates." These agents of the Unions call meetings of workmen, sometimes during working hours, and issue "down tools" and other orders at will, sometimes on the most frivolous pretences.

It seems to be the opinion of many American publicists that the Trades Unions of the United States are generally of an inferior kind to those which have been most successful in vindicating the same principle in the United Kingdom; and the present report supplies a good deal of evidence in favour of this view. The American Unions appear to be cast in the sensational "secret society" mould. Their founders are commonly addicted to the invention of fantastic "rituals;" and great parade is made of pass-words and similar nonsense. These organisations have consequently been devoid of the business character that has proved such a sound foundation for the older Trades Unions of the United Kingdom, and have been mere playthings for the workman's idle hours, when they have not been agencies for

terrorizing the sections of the community that have come under their ban. This may be gathered from the remark of the report that "the establishment of more benefit funds in connection with the Unions would give greater stability to the movement." In other words, too many of the labour organizations of the States have been of the character known here by the name of the New Unionism—that is, they have been "fighting societies" pure and simple. Their record is the same. In prosperous times they have flourished, and assumed threatening proportions; but, sooner or later, they have succumbed, either to financial weakness or to internal dissensions. In the States, as in England, the newer workmen's organizations have fallen largely under the influence of Socialists and Anarchists; and their proceedings are marked by many inconsistencies. Owing to their intimate relations with journalists, demagogues, and professional agitators. the New Unions make a considerable noise in the world; but it is observed that "the older Trades Unions have been the most successful in maintaining the rates of wages, and can show the best record in the prevention of strikes."

A great deal of miscellaneous information respecting industrial matters is contained in this report. For instance, the proposals for the establishment of statutory Arbitration Boards for dealing with labour disputes which are now before Parliament, have been copied directly from American examples given here. It would be more satisfactory if one could find fuller statistics of the working of these institutions. It seems, as might be imagined, that they answer fairly well in composing disputes about rates of wages and hours of labour; but when it comes to be a question of union against free labour, the employers flatly refuse to submit to arbitration. This also is what might be expected; and neither in the States nor elsewhere has any other means than force been found efficacious in settling these questions of principle.

Those who take an interest in co-operation and profit-sharing will experience disappointment in consulting this report. Somehow, the "land of the free" is not favourable to the development of the co-operative idea. Hard as it is to say so, this has often been due to dishonesty and mismanagement on the part of the officials of the societies, who have in too many instances "run away with the funds, or used the association for political purposes." The trail of the professional politician is over a good deal of these American records, which do not supply much evidence in favour of the cry for the abolition of the "Great Unpaid" that has recently been raised on this side.

A special chapter of the report is devoted to the subject of "Municipal Employment," which immediately brings up the instance of gas supply. The advocates of municipal control of public works urge that competition has, under existing circumstances, little to do with determining the rates charged for water, lighting, street railways, and other public conveniences. In regard to gas supply, "it remains a fact that competition between rival companies soon gives place to combination, and that prices are mutually adjusted to float the consolidated stock." On the other hand, the suggestion to municipalize gas supply evokes the spectre of political corruption. Mr. Dredge tells the unedifying story of the Philadephia Gas Trust, as to which a Special Committee reported in 1880 that the property was grossly maladministered. "The vast purchases of supplies, made at excessive prices from favoured parties, without competition or advertisement (in some instances from the trustees themselves, in violation of the ordinance); the disbursement of enormous sums annually for these purchases in cheques drawn to bearer; the frequent failure to produce any record of the supplies having been received or the work performed; the admission that, not content with paying bills rendered, the employees in some cases habitually made out the bills themselves"—these statements give a pretty picture of the administration of a Corporation gas undertaking. For other matters in this chapter, Mr. Dredge draws on Professor Bemis and Mr. Foote, whose writings have frequently been quoted in these columns.

There is an appendix to the report, dealing with the "Trust" system, whereby producers of certain commodities organize for the purpose of regulating the market value of these commodities. There cannot be any valid argument against the principle of this system in a Protectionist country; and it is not surprising to learn that, in American opinion, some of these Trusts have not worked badly for the community. It is stated that "the Standard Oil Trust seems to hake checked the natural rate of decrease in the prices which would have followed upon cheapened production." The plea that the public have a right to benefit from cheapened production does not carry weight in the States. It is always the producers who have the first say in these matters; and it is a very good thing for the community that, as Professor Jenks argues, competition "and the checked demand that would come with too high prices generally in the long run prevent the prices from being much higher than under free competition." The report concludes with an American bibliography of the subject.

In conclusion, we can recommend all students of the matters that have come into the purview of the Royal Commission on Labour to procure this report, and look through it for statements upon points specially interesting to themselves, when they will be sure to discover other information that will prove useful when least expected. As we remarked last week with reference to another Blue-book, these somewhat formidable publications, which have the reputation of being "dry reading," are not only in many cases more interesting than they look, but are a perfect arsenal of weapons for the demolition of agitators and grievance-mongers; and the one in question strongly supports our statement.

## MR. W. MACKENZIE AND MR. L. HISLOP.

It will be seen by the report of the proceedings at the "Informal" Meeting of Scottish Gas Managers last Wednesday, appearing in another part of the JOURNAL, that the first matter to occupy the attention of those assembled was the expression of their condolence with the widows and families of two of their colleagues who had just passed away. We refer to Mr. William Mackenzie, of Dunfermline, and Mr. Laurence Hislop, of Uddingston.

In the case of Mr. Mackenzie, the circumstances of his death were particularly sad. He had been in failing health for several years; and one of his sons was associated with him in the management of the Dunfermline Gas-Works. Of late Mr. Mackenzie had been confined to his house; but he would possibly have held his position to the end, and been able to discharge the duties, had not the Directors seen fit to dispense with his son's services. It was this circumstance that led him to leave. It is only five weeks since his resignation was intimated, and he was granted a retiring allowance. At the time it was hoped that after May, when he would be relieved of the worry of attending to the ordinary business of the Company and the transfer of the works which has been resolved upon, he might recuperate his health; but in this his friends have been disappointed. Mr. Mackenzie was a native of Edinburgh. His father was a gas-meter maker; and his first acquaintance with gas manufacture was when he was set to work in his father's factory. He afterwards served in the gas-works at Greenock; and in 1853 he was appointed Gas Manager at Cupar. In 1866, he received the appointment at Dunfermline. As Secretary of the North British Association of Gas Managers, his zeal for the welfare of the gas industry brought him more prominently forward than, perhaps, accorded with his quiet nature; but his courtesy made him a most endearing official; and he will be missed by all who frequent the gatherings of the Association. He died last Tuesday morning in his sixty-fifth year; leaving a widow, four sons, and two daughters.

Mr. Hislop, who is a cousin of Mr. G. R. Hislop, of Paisley, succumbed to an attack of typhoid fever. He was born at Biggar, in Lanarkshire, fifty-six years ago, and became a blacksmith in his father's shop. His father was one of the Directors of the Biggar Gas Company; and this gave him an introduction to the gas industry. After leaving home, he was for a time in the service of Messrs. R. Laidlaw and Sons, at their Barrowfield Iron-Works, in Glasgow, and was sent by them to Moscow, where he was for a year superintending very large extensions upon the gas-works. In the same capacity he visited Galashiels and other places, and led a very active life for some years. Settling down, he was for two years Manager of a small gas-works at Carfin; and for the last twenty-two years had been Manager of the Bothwell and Uddingston Gas-Works. When he was appointed, the output from the works at Uddingston was only 4 million cubic feet a year; it is now 25 millions. Mr. Hislop was the designer of the works, which have lately been very largely extended. It is expected that his son will succeed him in the management.

**The Ignition Temperature of Hydrogen.**—Herr A. Mitscherlich, continuing his investigations on the ignition temperature of a detonating mixture of oxygen and hydrogen, already referred to in the JOURNAL (*ante*, p. 540), finds that, contrary to anticipation, a diminution of pressure lowers the ignition point of the mixture, and an increase of pressure raises it.

**The Sanitary Institute.**—We have received from the Secretary of this Institute (Mr. E. White Wallis, F.S.S.) a copy of the annual report of the Council, which was read at the ordinary general meeting on the 8th of March. We learn therefrom that during the past year there were 45 London and 96 provincial lectures and examinations; the attendances at the former numbering 4062, and at the latter 7567. The lectures specially arranged for sanitary officers in London were 34, with 3263 attendances; those delivered in the provinces numbering 87, with 7269 attendances. At the annual congress, which took place at Portsmouth, there were five sectional meetings, five conferences, and three lectures, which were attended by 1938 persons; while the exhibition of sanitary appliances held in connection therewith, at which a number of lectures were given, was patronized by 49,000 visitors during the four weeks it was open. It is satisfactory to find, from the statement of income and expenditure, which has been approved by the Auditors (Messrs. Alfred Lass, Wood, and Co., and Mr. Magnus Ohren), that the balance for the past year was £324; and that an important contribution to the funds has been received from the Trustees of the late Mr. R. Berridge, of Ballynahinch Castle, Ireland, in the shape of a sum of £9248 in Consols, part of a legacy left by him "for the advancement and propagation of education in the economic and sanitary sciences."

## NOTES.

### Preservative Paints for Ironwork.

Mr. John Newman has contributed an article to *Iron* on the composition of paints for metallic structures. He remarks that any attempt to prevent corrosion of the metal by increasing the number of coats of paint must be deceitful; and he insists on the necessity of constant watchfulness and attention to the duty of preservation. By way of illustrating the fact that protective paints ought to be adapted to the nature of the material to be covered, Mr. Newman instances cables of suspension bridges, which require some coating more elastic than ordinary oil paint. Coal tar is best for this purpose, as it does not crack or blister. Mr. Newman states that it is questionable whether linseed oil thickened by an earthy pigment is not sufficiently good for ordinary house and farm purposes. For exposed ironwork something better is needed; and the writer does not consider any linseed oil paint durable or satisfactory for outside ironwork, because they all become oxidized, lose their tenacity, blister, flake, crack, and finally separate or "weather away." Moreover, when exposed to gaseous ammonia, the alkali combines with the oil, forming a saponaceous film, which dissolves in water, and continually presents a fresh surface to the same action. Thus the oil is extracted from the paint, which then becomes friable. It is stated that paints made with euphorbium possess remarkable powers of adhesion to iron or steel. Tar or pitch paints are also valuable on account of their adhesive and elastic qualities. A tar varnish often used is composed as follows: Raw coal tar, 10 lbs.; tallow, 2 lbs.; lamp black, 1 lb.; rosin, ½ lb.; finely-sifted, fresh-slaked lime, 10 lbs. These ingredients are to be thoroughly mixed and heated, and applied hot. A commoner coal-tar paint is made with 1 lb. of finely-sifted, freshly-slaked lime, and about half a pint of naphtha, to a gallon of tar. Mr. Newman thinks the use of tar and tar paints is likely to increase for exposed iron and steel work not required to have an ornamental appearance. A mixture of tar and asphalte is warmly recommended. If coloured paint is to be used, it should, according to this writer, be ground with the euphorbium medium already mentioned.

### Messrs. Bryan Donkin and Holliday on the Mahler Calorimeter.

In a paper read before the Institution of Civil Engineers, Mr. Bryan Donkin, jun., and Mr. John Holliday discuss the employment of the Berthelot-Mahler calorimeter as a means of determining the calorimetrical power of coal for industrial purposes. The results of a most extensive series of experiments with this apparatus are given in the *Bulletin* of the Société d'Encouragement. It appears from the tables in which the outcome of these determinations is given that, with abstraction of the ash and the hygrometric water, the calorific power of solid fuels of vegetable origin varies, in round numbers, from 4500 calories for wood to 8900 calories for bituminous coals per kilogramme, which is equivalent to from 8100 to 16,020 British units of heat per pound of combustible. The least calorific are the dry flaming coals, whose combustion heat varies from 14,114 to 15,466 British heat-units per pound; after which come the gas coals, which run to between 15,000 and 16,000 British units per pound. It has been found that certain anthracitous coals have a high calorific value; while the true anthracites have a value equal to the non-caking flaming coals. The most economical coals would appear to be the bituminous and semi-bituminous kinds, which stand at from 15,466 to 15,956 British units per pound. Above these fuels stand colza oil, with its 17,280 British heat-units per pound, and petroleum and coal gas, which are credited with 19,800 British heat-units per pound. With regard to the vexed question of the possibility of computing the calorific value of a combustible from its composition as determined by analysis, M. Mahler is cited as having proved that Dulong's law gives the calorific power of coals with sufficiently near approximation for industrial purposes, but that it cannot be applied to such fuels as wood and peat, which contain a high percentage of oxygen, nor to cannel coal.

### The First Perceptions of Light and Colour.

Captain Abney has been lecturing before the Royal Institution upon the sensitiveness of the eye to light and colour. He described the varying appearances of flowers and other coloured objects under different degrees of illumination; pointing out that after sunset a garden has a changed aspect from that presented by it in daylight. The red flowers will appear dull and black, the blue flowers a whitish grey, and the brightest pale yellow flowers of the same tint; the grass will be grey; and the green of the trees the same nondescript colour. The lecturer went on to speak of the existence of a "grey heat," which intervenes between the ordinarily observed black and red heats of artificially-heated bodies. This phenomenon was shown by the aid of an incandescent electric lamp surrounded by a tissue paper shade, which had a current passed through it. In the perfectly dark room, the lamp was at first invisible—being merely black hot. An increase of current made the shade look a dim grey; while a further increase showed it as illuminated by a red, and finally by a yellow light. A bunch of flowers placed in the rays of an electric lamp at first showed every colour perfectly; but as the light was gradually dimmed down, the reds disappeared first, while the blues remained, and the green leaves became dark. These two experiments showed that in illumination there is a colour (if grey may be called one), which has to be reckoned with. The question arises at what stage a colour assumes this grey hue, and at what stage of illumination the impression of mere light also disappears; and whether, in any case, the two disappear simultaneously. In carrying out the experiments suggested by this inquiry, Captain Abney used an amyl-acetate standard lamp, of about 0·8 of a standard candle; and he arrived at the following results, among others: A screen placed 817 feet away from an amyl-acetate lamp supposed to be giving a violet light, would be just invisible. The blue-green light would be invisible at 770 feet distance; the green light, at 550 feet; the orange, at 180 feet; and the red, at 60 feet. In other words, "with equal luminosities, the violet requires about 175 times more reduction to extinguish it than does the red; and probably about 25 times more than the green." Captain Abney also showed how it is that moonlight passing through painted glass windows is colourless on the grey stone floor of a cathedral or church—Sir Walter Scott's observation notwithstanding. It is merely because the illuminating power of the moon is insufficient to arouse the colour-perceptiveness of the normal eye. He further pointed out that "the first sensation of light is what answers to the violet sensation when it is strong enough to give us the sensation of colour." The other sensations are grafted upon this one; but in what manner, it is difficult to imagine.

## COMMUNICATED ARTICLE.

### OXIDE OF IRON: A MONOGRAPH.

By John T. Sheard, F.C.S.

(*Continued from p.* 634.)

#### The Chemical Reactions of Oxide of Iron in Gas Purification.

When oxide of iron is exposed to the action of sulphuretted hydrogen, its original red or reddish-brown colour is turned to black, with a considerable development of heat. The chemical reactions which take place have been investigated by Mr. Lewis T. Wright.* From his researches it would seem that there are two principal or ultimate reactions, which may be expressed by the following equations (omitting from the formulæ any water of hydration):—

(A) $Fe_2O_3 + 3\,H_2S = Fe_2S_3 + 3\,H_2O$

Ferric oxide. Sulphuretted hydrogen. Ferric sulphide. Water.

(B) $Fe_2O_3 + 3\,H_2S = 2\,FeS + S + 3\,H_2O$

Ferric oxide. Sulphuretted hydrogen. Ferrous sulphide. Sulphur. Water.

In the one case, the oxygen of the oxide is replaced by an equivalent amount of sulphur from the sulphuretted hydrogen; ferric sulphide and water being the resulting products. In the other, the iron is found combined with only two-thirds the amount of sulphur (the valency, or combining value, of the iron having been reduced in the operation, and a *ferrous* instead of *ferric* compound formed), and the remaining third part of the sulphur is deposited in the free state. Thus a like amount of sulphur is taken up in both reactions; but, in the one, the whole of it is combined with iron, whereas in the other, one-third of it is free.†

That both these reactions take place, Wright proved by dissolving out the free sulphur, after sulphiding oxide, without in the interim exposing the material to the air, and comparing the quantity of sulphur thus obtained with the total amount produced in the reaction, as obtained after revivifying the material, and thus liberating the "fixed" sulphur. From the results thus obtained, he concluded that, while both reactions invariably occur, (A) is the predominant one, and that there is no definite relation between the two. His experiments show a variation in the proportion of free to total sulphur of 1-10th to 1-20th.

On exposing the sulphided oxide to the air, there is a further considerable development of heat, steam is given off, the iron becomes re-oxidized, free sulphur is deposited in the material, and the mass returns more or less completely to its original colour. The chemical reactions involved in this change may be represented as follows:—

(A) $Fe_2S_3 + 3\,O = Fe_2O_3 + 3\,S.$

(B) $2\,FeS + 2\,O = 2\,FeO + 2\,S.$

The ferrous oxide (FeO) immediately absorbs more oxygen; being reconverted into the more highly oxidized ferric oxide ($Fe_2O_3$). The final result of the complete cycle of sulphidation and

* See *Chem. Soc. Journal*, Vol. XLIII., p. 156; and JOURNAL, Vol XL., p. 909.

† Mr. J. A. Wanklyn, in his "Gas Engineers' Chemical Manual," gives the following as the reaction which, he considers, is chiefly concerned in the change:— $Fe_2O_3 + H_2S = Fe_2O_3 + S + H_2O.$ He thus credits the ferric oxide with the absorption of only one-third as much sulphuretted hydrogen as is shown by the reaction given in the test. In support of his opinion, he asserts that "Irish native oxide does not absorb more than 5 per cent. of its weight [presumably when containing some 40 per cent. of moisture] of sulphuretted hydrogen." On the contrary, good Irish oxide will absorb, as I have repeatedly proved, more than three times that amount.—J. T. S.

revivification is therefore to bring the ferric oxide back to its original active state; each equivalent of ferric oxide in active operation having brought about the liberation and deposition in the material of one and a half equivalents of sulphur; in other words, 80 parts by weight of active ferric oxide ($Fe_2O_3$) cause the liberation of 48 parts of sulphur.

### Effect of Temperature upon Purification.

As with other chemical reactions, temperature is a very important factor in promoting and facilitating the union of sulphuretted hydrogen with oxide of iron. It has been shown by Pictet that there is a certain limiting temperature below which chemical affinity ceases to act; just as there is a temperature above which the force of affinity is overcome, and dissociation of chemical compounds takes place.* So in this combination of sulphuretted hydrogen with oxide of iron, although the reaction itself produces a high degree of heat, yet if by any means this heat be abstracted at as great a rate as it is produced, and the temperature of the mass be thereby reduced, or prevented from attaining to a certain limit, the force of chemical affinity will be considerably diminished. For instance, samples of oxide were submitted to sulphuretted hydrogen in U-tubes which were immersed in water maintained at 50° Fahr., while at the same time corresponding experiments were carried out with U-tubes exposed to the atmosphere at 60° Fahr. The high specific heat of the water allowed of the heat generated by the chemical action being abstracted as quickly as produced, so that the purifying material itself did not increase in temperature; on the other hand, the temperature of oxide kept in air increased considerably. The mean of the results obtained was as follows:—

| | In Water at 50° Fahr. | In Air at 60° Fahr. |
|---|---|---|
| Sulphur absorbed | 7·25 per cent. | 8·7 per cent. |

On the other hand, by artificially increasing the temperature of oxide which is absorbing sulphuretted hydrogen, its purifying capacity is enhanced. Probably there is a definite temperature which is most suitable for bringing about the chemical action desired, and which might be determined by a suitable course of experiment. Experiments made on the same oxide in U-tubes exposed in the one case to the atmosphere, and in the other immersed in a water-bath maintained at 120° Fahr., gave the following results:—

| | Sulphur absorbed at 60° Fahr. | Sulphur absorbed at 120° Fahr. |
|---|---|---|
| First absorption | 12·8 per cent. | 13·8 per cent. |
| Second absorption | 6·6 „ | 7·5 „ |

The gain at the higher temperature is not very great, though it is sufficently marked. Further experiment shows that the improvement obtained through employing an artificially-raised temperature is the more pronounced the more sluggish the oxide employed. On the other hand, judging from such experiments as I have made, it would seem that at 212° Fahr. not only is there no gain from the increased temperature, but rather the reverse. Further experiment on this point is needed, however, before the matter can be decided.

From what has been advanced, it may be inferred that the artificial heating of oxide purifiers, especially in cold weather, would materially enhance the purifying power of their contents.

### Revivification of Oxide.

On taking out sulphided oxide from a gas purifier to expose it to the air for revivification, it is well to lay it in long, narrow heaps of from 20 to 30 inches high; leaving between the heaps space in which eventually to spread out the material in a thin layer. By leaving the oxide in heaps, instead of immediately spreading it on the ground. the heating of the material, which signalizes the commencement of the chemical reaction required, is much facilitated. When the surface of the heap has changed colour, showing that revivification on the outside has taken place, the top layer may be thrown out upon the vacant ground; turning it over so as to expose the unoxidized material to the air. With new oxide, the chemical action during revivification is occasionally so intense that the temperature rises high enough to ignite the sulphur contained in the material. By leaving the fouled oxide in heaps for some time before spreading it out on the ground, not only is the process of revivification facilitated, but the liability of very pyrophoric material to fire is diminished; and if ignition does take place, it is more easy to control.†

In revivifying sulphided oxide, there are two conditions which must be seen to if complete and speedy revivification is to be ensured. The first is that the material should attain to such a temperature as will facilitate the ready expulsion of the water that has been formed in the purifier by the mutual reaction of ferric oxide and sulphuretted hydrogen ($Fe_2O_3 + 3H_2S = Fe_2S_3 + 3H_2O$), and of which a great part has been deposited in the purifying material. The second is that it should be exposed to a comparatively dry atmosphere. As already stated, the first condition can generally be met by heaping up the sulphided oxide as it is taken out of the purifier, whereby as revivification sets in the heat produced, instead of being at once disseminated into the atmosphere, is utilized to raise the temperature of the whole mass so high as to facilitate the liberation of steam, and so further the extension and development of the chemical action.

The importance of heat in promoting and facilitating revivification is exemplified in the following experiments: Three equal samples of fouled oxide were exposed to the air. The first was artificially heated by being subjected to radiant heat from a fire; the second was subjected to atmospheric temperature only; the third was similarly exposed to the atmosphere, but its surface was well moistened with water. The heated sample revivified completely in less than an hour; the other two required from 18 to 24 hours before being fully revivified—the third sample, where moistened, being much behind the drier portions. It was also noticed that a very thin layer of oxide required a much longer time for revivification than a thicker one, because of the latter condition facilitating the heating of the mass, while a thin layer checks the tendency. It would therefore seem that, for revivification of sluggish oxide (where time is an important consideration), artificial means may with advantage be resorted to for raising the initial temperature of the mass. But if artificial heat be employed, it should, of course, be well under control; otherwise a more intense reaction may set in than is desired, and the temperature rise so high as to fuse or even fire the liberated sulphur.

With regard to the second condition referred to, it has often been remarked that revivification takes place freely on a bright clear day; whereas, in dull, heavy, or foggy weather the chemical activity is almost *nil*. It would seem desirable to provide artificially for securing this second requisite for successful revivification—viz., to dry the air previous to its contact with the oxide. This is, however, a condition of things not so easy to bring about, unless the oxide be revivified within the purifier, which would again introduce other difficulties. But there can be no doubt that an artificially-dried air supply would much facilitate revivification. That this is so may clearly be seen exemplified in those gas-works where the lime-store and revivifying-shed are contiguous. In these circumstances, it will often have been observed that, when the wind blows from across the heap of lime to the oxide, revivification is much more speedily effected than at other times—a result which is, of course, due to the partial drying of the air by the lime.

### Improvements in the Methods of Applying Oxide.

Two successive stages of advance have been made upon the common method of employing oxide—viz., first, to revivify the material without taking it out of the purifier, after being sulphided and the purifier thrown out of action; secondly, to produce continuous revivification simultaneously with the fouing of the oxide, by admitting the necessary air or oxygen into the purifier along with the gas to be purified. Both processes have been employed at various times, and with more or less of success, from a comparatively early date; and there is more activity in both directions now than ever before. But in their carrying out in practice there are serious difficulties involved, which have hitherto operated to prevent either of them from being generally adopted.

It has been seen that the first employment of oxide by Evans, in 1849, was immediately followed by his inaugurating the method of revivification *in situ*. He had, in 1845, drawn air through fouled lime purifiers in order to deodorize the spent lime; and it was therefore but a short step for him to apply the same method to oxide purifiers to secure a superior result. In 1852, Hills patented the method of "renovating hydrated oxide of iron or any other oxides of iron that are capable of being renovated by atmospheric air (after they have become inert by taking sulphur from the gas), by admitting or forcing atmospheric air into the purifiers at the same time and in conjunction with the gas to be purified." Laming, later in the same year, patented the application of oxygen for the same purpose; the gas to be purified being mixed with as much oxygen as it contained sulphuretted hydrogen, and the mixture passed through oxide purifiers. "The oxide of iron," it is stated, "thereby remains unchanged; and the use of it may be continued until the deposited sulphur renders the material impervious to the gas."

(*To be continued.*)

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**Imperial Continental Gas Association.**—At the forthcoming half-yearly meeting of this Association, the Directors will recommend a dividend of 5 per cent. for the six months ending Dec. 31, 1892, together with a bonus of 1 per cent., both free of income-tax.

**Death of Mr. J. Elliot, of Dalbeattie.**—In addition to the vacancies caused in the ranks of Scottish gas managers recorded elsewhere, we regret to announce another, resulting from the death, on Tuesday morning last, of Mr. John Elliot, Manager of the Dalbeattie Gas-Works.

**The Management of the Dunfermline Gas-Works.**—The Directors of the Dunfermline Gas Company received 56 applications for the post of Manager and Secretary, in succession to the late Mr. W. Mackenzie. There was a general expectation that, under the advice of Mr. T. Newbigging, the appointment would be given to someone south of the Border. The result is in accordance therewith, as the successful applicant is Mr. Herbert Pooley, Assistant-Manager of the Birkenhead Gas-Works. Owing to Mr. Mackenzie's death, Mr. Pooley will enter upon his duties at as early a date as possible. He is a son of the head of the firm of Messrs. Pooley and Son, the well-known weighing-machine manufacturers; and is, we learn, a young man of great promise. He was a pupil of Mr. T. O. Paterson.

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* See *ante*, p. 542.

† *Vide* Newbigging's "Handbook."

# TECHNICAL RECORD.

## SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The Half-Yearly Meeting of this Association was held at the Great Western Railway Gas-Works, Wormwood Scrubbs, last Tuesday, under the presidency of Mr. E. C. RILEY (Swindon), the Company's Gas Engineer. It will be remembered that, at the previous two meetings, the members had before them the subject of the lighting of railway trains by oil gas; and they decided on the last occasion—Mr. Riley having been elected to the chair—to hold the present meeting at Wormwood Scrubbs, in order that they might have the opportunity of examining the plant in operation there for producing and compressing oil gas. On assembling shortly before noon, the visitors were conducted by the President round the works, some particulars concerning which will be found in his Inaugural Address. Having afterwards partaken of a light luncheon, the members immediately entered upon the business portion of the day's proceedings.

The HON. SECRETARY and TREASURER (Mr. N. H. Humphrys, of Salisbury) read the notice convening the meeting.

### MINUTES OF LAST MEETING.

On the motion of the PRESIDENT, seconded by Mr. T. W. R. WHITE (Sherborne), the minutes of the meeting held at Bournemouth in September last were taken as read.

### NEW MEMBERS.

The PRESIDENT said the following applications for membership had been approved by the Committee; and he had much pleasure in moving their acceptance: Messrs. W. H. Green, G. M. Robins, and E. H. Stace, of Bournemouth, and G. W. Thomas, of Ringwood.

Mr. S. W. DURKIN (Southampton) seconded the motion, which was unanimously agreed to.

### PLACE of AUTUMN MEETING.

A conversation ensued with regard to the town at which the September meeting should be held; and, on the proposition of Mr. J. LOWE (Weymouth), seconded by Mr. T. GILES (Bridport), it was resolved to visit Exmouth—it being understood that Mr. W. A. Padfield, of Exeter, had undertaken the preliminary arrangements.

The PRESIDENT then read the following

### INAUGURAL ADDRESS.

Gentlemen,—My first duty is to tender my sincere thanks for the honour you have done me in electing such a comparatively young member of the Association to the important post of President. I should have preferred for some time longer to have occupied the position of a private member; but, since it has been your pleasure to confer upon me this mark of your confidence, I shall endeavour to do all I can to promote the objects for which I conceive the Association exists—viz., the consideration and discussion of both the principles and practice of the department of manufacture in which we are engaged.

Already this year, the Presidents of several District Associations have delivered inaugural addresses, which appear to have touched nearly every question of interest in modern gas manufacture; and it will be almost impossible to bring new features or fresh subjects before you to-day. I will not, however, assume that, like the ancient Athenians, you are ever thirsting to hear some new thing, but that what we really want is to consider the questions arising in the course of our own experience, and the advantages and disadvantages of methods, arrangements, and appliances in the light of our own practice, in order that our views may be enlarged, modified, or corrected by comparison with the experience of others. My own experience, as a Railway Gas Manager, lies in some respects in a different groove to most of those present, as the details of working both coal gas for general use, and oil gas for train lighting, particularly in distribution, are not in several respects the same as that of a company or local authority supplying the general public. Instead, therefore, of attempting a review of the gas industry generally during the last year, or an examination of the latest theories or departures in gas matters, I will content myself with looking at several features of our work as they have touched my own experience—a line so usefully taken up by Mr. Smith, of Smethwick, in his address to the Midland Association.

In many cases, the cost of the coal, before it finds its way into the retort, is much greater than it should be, owing to the question not having been considered in all its bearings. The mistake has perhaps originated in the site of the works, through want of care in its position in relation to water or railway, or neglect in taking full advantage of difference of levels in saving labour, and in the location of coal-stores and stocks, so that the cost of second handling shall be reduced as much as possible. These site difficulties are, I think I ought to say, not always the fault of the engineer, as there are often many diverse influences and interests which affect this first and important step. This question of saving labour in handling both coal and coke is, I notice, receiving much attention from the great companies and corporations of our largest towns and cities, who are spending large sums in the provision of high-level lines, conveyors, and elevators; but I would venture to submit that, subject to the proportional and proper limits of expenditure, smaller works might find advantage from careful attention to these questions. In the largest works belonging to this [the Great Western Railway] Company at Swindon, in connection with an extension of the retort-house made recently, inclined roads, carried on brick arches, have been laid up to the tops of the coal-stores; so that hopper-waggons may be used to drop the coal directly into its place without the intervention of the shovel. Also a deep dock or siding has been provided for loading the coke into the railway-trucks direct. This is in connection with an arrangement of trolleys for receiving and loading the coke. Light tram lines have been laid close to, and parallel with, the front of the retort-beds; the tops of the trolleys passing just under the middle row of mouthpieces—the bottoms being retained for supplying the furnaces. Two charges are drawn into each trolley each journey; and then they are pushed down to the end of the retort-house, and stopped over drainage pits with water-cranes above them. A valve, placed in a convenient position for the stoker's hand, enables the water to be turned on for a minute; and, when the coke is fully quenched, the trolley is pushed a few yards further to bring it exactly opposite the truck being filled, the scoop of the trolley is swung round, and the contents tipped into the railway-truck ready for despatch to any point desired. We found a little difficulty at first in getting the men into the new arrangement, as we had to start it during the heavy make in November. I am, however, pleased to say that the arrangement works with perfect smoothness and comfort; and, if any difference exists in the time occupied in the work, it is in favour of the new arrangement. This retort-house is designed for the adoption of machinery at any time in the future it may be considered desirable to provide it; and, when that is done, neither coal nor coke will be touched by the shovel from the time the coal arrives from the colliery until the coke is received in the truck at the place where it is to be finally consumed.

The question of condensation is one that merits, but does not always obtain, the amount of attention that its importance demands. By condensation, the whole influence of temperature on the gas between the retorts and the holder should be considered. The action of the hydraulic and foul mains in this respect has been brought prominently before this Association by our Secretary and others; but it is important that the influence of the other plant—such as scrubbers and washers, and even purifiers—should be taken carefully into consideration. My attention was called to this matter from the rapid growth of the same works I previously referred to, which, when first started about twelve years since, had an annual make of about 50 million cubic feet, but now has reached a make about treble that quantity. It will, of course, be obvious that extensions of plant have been necessary to meet increased requirements; the only part of the works untouched being the condensers. These are of the annular type, 2 ft. 8 in. in diameter, with a surface area of 1828 superficial feet; but the whole of this is not even now used in winter, as the central tube in one of the four columns is stopped—it being found that, with the lower scrubbers and washer, the condensation was quite rapid enough, even when the make was greatest, and during the severe frost, the temperature of the condensers was raised by steam-pipes fixed temporarily. In Newbigging's "Handbook," the capacity for air condensers is given as from 5 to 10 superficial feet of condensing area for every 1000 cubic feet of gas per 24 hours of maximum make; while the capacity we have is not quite 3 feet, and, as we have provision for increasing the number of retorts, of course the proportion will be still less.

In looking into this matter, the temperatures were taken at various points; and the following table [see next page] will illustrate my meaning. The table shows the effect of outside temperature varying from 20° to 88° Fahr:

This illustration seems to point to the probability that, in many cases, the open air condensers are frequently too large altogether, or at any rate in winter, and that increased length and area would be desirable in the foul main, and provision for reducing the area of the outside condensers in cold weather, in order to ensure more uniform results.

So much has been written and said on the question of purification recently, that the only allusion I shall make to the subject is to ask if the restrictions imposed as to the presence of sulphur in minute quantities is of sufficient disadvantage that the expense of its removal is worth to the consumer the amount of the additional cost of the gas. This question is finding a place in many minds, and has found an audible voice in the Bill promoted by the Crystal Palace Gas Company, who ask for the limit to be 30 grains per 100 cubic feet, instead of 17 and 22 grains; and if this question can be raised in a district like that served by the Company referred to, with important residential areas, how much more unnecessary do the restrictions appear in the case of poor or manufacturing neighbourhoods or cheap business quarters, where so much gas is used for outside lighting, cooking, motive power, or manufacturing and industrial processes.

With reference to the subject of gasholder construction, it

*Table of Temperatures—Condensation of Coal Gas.*

| Outside Tem. | Foul Mains. | | Condensers. | | | Scrubbers. | | | | Washer. | | Meter. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. 1. | No. 2. | Inlet. | No. 3. | Outlet. | Inlet. No. 1. | Outlet. No. 1. | Inlet. No. 2. | Outlet. No. 2. | Inlet. | Outlet. | Inlet. |
| Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. | Fahr. |
| 20° | — | 100° | 90° | 70° | 58° | 66° | 52° | 52° | 46° | 54° | 32° | 43° |
| 22 | — | 98 | 90 | 68 | 58 | 66 | 52 | 52 | 46 | 66 | 34 | 42 |
| 28 | — | 100 | 94 | 80 | 64 | 66 | 52 | 52 | 44 | 68 | 44 | 42 |
| 30 | — | 110 | 100 | 84 | 76 | 74 | 54 | 54 | 46 | 68 | 44 | 42 |
| 32 | — | 116 | 100 | 86 | 82 | 82 | 62 | 62 | 50 | 70 | 52 | 46 |
| 34 | — | 122 | 106 | 90 | 86 | 84 | 64 | 64 | 52 | 70 | 50 | 44 |
| 36 | — | 120 | 108 | 90 | 88 | 88 | 66 | 66 | 54 | 54 | 40 | 44 |
| 38 | — | 122 | 114 | 92 | 80 | 82 | 64 | 66 | 56 | 56 | 44 | 46 |
| 40 | 114° | 108 | 104 | 88 | 76 | 82 | 72 | 74 | 66 | 70 | 56 | 54 |
| 42 | 116 | 112 | 106 | 84 | 70 | 78 | 64 | 66 | 58 | 66 | 54 | 58 |
| 44 | 118 | 110 | 102 | 78 | 64 | 73 | 58 | 61 | 54 | 58 | 46 | 51 |
| 46 | 115 | 112 | 106 | 85 | 70 | 77 | 66 | 68 | 61 | 68 | 54 | 61 |
| 48 | 104 | 95 | 86 | 62 | 52 | 64 | 51 | 56 | 47 | 53 | 44 | 52 |
| 50 | 135 | 130 | 120 | 90 | 76 | 82 | 66 | 68 | 62 | 66 | 56 | 58 |
| 54 | 130 | 120 | 112 | 86 | 74 | 80 | 68 | 70 | 64 | 70 | 62 | 59 |
| 58 | 116 | 112 | 104 | 87 | 73 | 86 | 67 | 70 | 63 | 66 | 58 | 60 |
| 60 | 124 | 120 | 112 | 96 | 84 | 88 | 76 | 78 | 70 | 74 | 64 | 62 |
| 64 | 128 | 122 | 104 | 80 | 67 | 78 | 68 | 72 | 66 | 70 | 64 | 62 |
| 68 | 106 | 106 | 96 | 79 | 66 | 78 | 66 | 68 | 62 | 65 | 56 | 64 |
| 70 | 130 | 120 | 108 | 84 | 70 | 80 | 70 | 72 | 70 | 73 | 63 | 62 |
| 72 | 126 | 126 | 111 | 96 | 87 | 90 | 78 | 81 | 78 | 80 | 74 | 65 |
| 74 | 124 | 123 | 110 | 80 | 70 | 76 | 70 | 72 | 70 | 70 | 68 | 65 |
| 76 | 124 | 122 | 115 | 92 | 84 | 87 | 80 | 83 | 82 | 84 | 74 | 65 |
| 78 | 124 | 122 | 113 | 92 | 81 | 17 | 79 | 82 | 76 | 79 | 82 | 64 |
| 80 | 122 | 122 | 119 | 104 | 95 | 93 | 86 | 88 | 88 | 87 | 81 | 64 |
| 84 | 132 | 132 | 120 | 113 | 95 | 96 | 86 | 88 | 83 | 85 | 79 | 69 |
| 86 | 135 | 132 | 118 | 100 | 90 | 92 | 85 | 84 | 86 | 88 | 81 | 67 |
| 88 | 132 | 132 | 120 | 113 | 95 | 95 | 86 | 88 | 83 | 85 | 79 | 69 |

may be interesting to members to mention that the two-lift holder erected by this Company at their Swindon Gas-Works about three years ago, with guide-framing to the lower lift only, has given no trouble whatever; and its behaviour in the roughest weather is ample evidence as to its stability.

In the consumption of gas, the field of useful application is a very large one. A convenient arrangement for warming meter and governor houses in very small works where no steam was available, we have found to be a very simple gas-heated boiler, with circulating-pipes. This, with a small consumption of gas, has proved an excellent precaution against frost, with the minimum of attention or labour. In the important department of this Company, which is under the control and direction of Mr. Dean, of Swindon—I mean the Locomotive and Carriage Department (of which the Gas Department is only a very small section)—not only at Swindon, but over the whole system, which embraces the greatest extent of mileage of any railway in the kingdom, gas is made to do useful service in many quiet and unsuspected places. The water-cranes, which are so exposed to the influence of frost in severe weather, are frequently, where gas is available, kept from freezing by jets in out-of-the-way places underneath. Gas also is a useful servant in burning off paint; in providing clean and steady fires for lamp makers and tinmen; in heating tyre-furnaces, not only for taking off and putting on carriage and waggon tyres, but the large and heavy locomotive tyres up to 8 feet diameter; rivet-heating furnaces, and various applications of the Bunsen burner, are found rendering useful service in various departments; while, in the foundry of our large works at Swindon, the core-drying ovens, 24 feet long, are heated by an arrangement of gas-burners, which takes the place of furnaces and heating flues—the principal advantages being the greater facility for obtaining an entirely uniform temperature, the saving of labour attending to furnaces, as well as of labour and material for the repairs and maintenance of the same. Gas-engines are also beginning to take their place alongside the steam-engine in the provision of motive power.

In oil-gas manufacture, this Company, in common with most of the leading railways of the country, are rapidly increasing their provision for the manufacture, compression, and storeage of oil gas at various selected stations on their system, in order to provide for the supply of the constantly growing number of carriages fitted with gas apparatus and lamps. A variety of burners are also receiving attention; and the mushroom-shaped regenerative burner is competing for a share of the public favour with its formidable flat-flame rival. On the Continent of Europe, in America, and India, oil gas train lighting is already making considerable progress; and with the facilities of intercourse now existing, we may be sure that Australasia and even Africa will soon follow.

In the field of general lighting, great possibilities are opened up in the study and investigation of substances and appliances for incandescent gas lighting. Mr. Leicester Greville, in his most suggestive paper in the JOURNAL OF GAS LIGHTING for Jan. 24 last, points out that the high result obtained in testing the Welsbach lamp, was given equally when the normal illuminating power of the gas was reduced to about one-third its original value; and if we are to compete with the prophesied full development of electric lighting which Mr. W. H. Preece announces is to equal gas at 2d. per 1000 cubic feet, it seems to me this is, as far as present indications allow us to judge, the direction in which we must look. The competition in regenerative high-power lamps will tend to lessen their cost, develop further improvements, and bring them more within the reach of ordinary consumers.

Turning aside from appliances either for the manufacture or consumption of gas to the relationship between the gas companies and their managers, and the men they employ, I think the gas industry, as well as the manufacturing world generally, have been laid under a deep debt of gratitude to Mr. George Livesey by the battle fought and won for the right of employers to freedom of arrangement with their own men without outside intimidation or dictation, while at the same time he has been labouring, by statesmanlike measures, to bring about permanently improved relationship between the workers and those they serve, by giving them a personal financial interest in the success of the undertaking in which they are engaged. This is not only useful in removing friction and promoting good feeling, but is a practical development of a principle that seems to afford the most valuable and satisfactory common ground of interest for capital and labour; and in the spirit of unrest that obtains in many quarters, and the influence that can now be brought to bear upon legislation by the rank and file of labour, this great plan of profit-sharing, built on the foundation of community of interest and mutual benefit, appears to point the way to amicable and satisfactory lines on which many of the labour problems of the future may be solved, and without aiming at the impossible Utopia of clever writers like the author of "Looking Backward," a state of things may be realized in which even the humblest toiler will have some proportional share in the prosperity of the undertaking in which he is engaged. The more this principle can be carried out in the industrial world, the greater the probability of avoiding the rude and objectionable form of contest, unfortunately so familiar under the term "strike," which could, with advantage to all, be relegated to the pages of history along with the feudal system of past ages.

Ever since I have had any opportunity of knowing anything of the working of the various Institutions and Associations connected with the gas-making interests of the country, I have been much impressed with the view that there is a want of general co-operation for practical purposes in the interests of progressive development, and a lack of that united concentration of experience and ability, for purposes of research or recommendation in reference to new processes and appliances, which ought certainly to be available. Briefly, what I think is needed, and is within the possibilities of practical politics, is a federation of the various societies on some basis which will practically leave untouched the organization and control of each separate Association, but provide a central representative body formed of chosen representatives from each, which will necessarily be the natural and official voice of the gas manufacturing interest and skill of the country, and shall be able to provide such a powerful Committee of Research or Reference that to them subjects which the industry at large would desire to see more fully investigated might be referred—such as the relative value and cost of ordinary and regenerative firing, of various types of retorts and settings, of air and oxygen purification, of various classes of lamps and burners, the standard light unit, and the existing regulations governing the quality and manufacture of gas.

I fear this simple fact is lost sight of—that, by far the majority of gas undertakings are, after all, what would be called small, and in these the directors, committee, engineers, or managers have not the power or opportunity of spending large amounts in experiments, and naturally would choose a policy of waiting rather than attempt what might be regarded as a doubtful experiment, which might possibly interfere with the power of paying the usual dividend; and even when perhaps a majority in the management were prepared to take a new departure in the provision of more modern plant or recent development of some new system of working, the conflicting statements of the promoters of rival firms interested in the working of the new method or plant, so perplex and confuse, that the result is a rejection of both. If, in circumstances of this kind, the disputed question had been before the Research or Investigation Committee of the Council of the Federated Gas Associations, the report of such a Committee would be a guide that, amid the babel of conflicting opinions, would be respectfully esteemed, and regarded as a counsel of safety. I am satisfied that new and improved methods and appliances would be adopted with greater rapidity, and with more general advantage to the industry at large, under a system such as I have sketched. In addition, what I may venture to call partial discoveries might be followed up, and reliable data obtained as to the value or possibility of the new appliance or method, without the loss of time to the country in waiting for someone or other to find time or opportunity to take the matter further.

I have not taken up this subject without some practical acquaintance with the possibilities of federated usefulness, as, in another sphere of associated effort, I know a federation of associations differing very widely indeed in their constitution, organization, and methods of work, and yet having one general underlying agreement. They are by this means able to meet and carry out many matters of general interest that could not be dealt with by individual associations, and also formulate recommendations and give expressions of opinion that are generally valued and usually gladly acted upon; and this knowledge makes me hopeful that the gas industry may yet be able to move on the same lines. The desirability of this has been referred to on many occasions by Presidents and members of our various Associations. Our last President (Mr. Irving) urged

its importance; and Mr. C. C. Carpenter, at the last Southern District meeting, alluded to a paper read on the subject by Mr. Addicks, of the American Gaslight Association, and suggested that we might take "the wind out of the sails" of our Yankee brethren by bringing about a federation in this year of grace 1893. As a practical step, the Committee of this Association have decided to bring before you two resolutions that will be submitted by Mr. Irving, which I trust will receive the friendly support not only of this meeting, but also that of other Associations. The scheme so drafted is to be sent to each society or Association for its consideration, amendment, or approval. If this scheme is received and considered generally with a sincere desire for united action, there need be no real barrier; and at any rate the year 1894 would witness this welcome addition to our usefulness, and a greater sympathy and unity obtaining among the gas engineers and corporations of the country.

I would now bring my remarks to a close by giving a few particulars as to the oil gas-works you have just been inspecting. When the Great Western Railway Company decided to commence the manufacture of oil gas, the battle was raging between the Pintsch and Pope systems; and, like the London and North-Western Railway Company, the Directors obtained their first plant from Messrs. Pope and Son, of Slough. This firm erected a bench of 6-inch cast-iron ⏢ retorts, 4-inch pipe condensers, 2 ft. 6 in. brick scrubber, a small low-pressure holder of 1000 cubic feet capacity, and four high-pressure reservoirs of 270 cubic feet capacity each, or a total of 1080 cubic feet. By the year 1887, the make of gas averaged over 40,000 cubic feet per week, and occasionally reaching 60,000 cubic feet per week. At this time the consumption began to increase at a rapid rate; and extensions had to be made, in order to provide the increased quantity required. A new bench of retorts was built; and the size was increased to 8 inches, and the length increased by 1 foot. The old bench was then pulled down; and two new benches of 8-inch retorts erected, providing 18 pairs of retorts in all. New cast-iron condensers consisting of five hollow cast-iron columns, 18 inches diameter, standing over a long brick and cement seal tank, an additional dry scrubber, 4 feet diameter, and an additional holder of 2000 cubic feet capacity, also nine more high-pressure reservoirs have been fixed, giving an increase of 2430 cubic feet storeage for high-pressure gas. We are now preparing to fix a reservoir over 7 feet diameter by 25 feet long over all, and 920 cubic feet normal capacity.

The compressing has hitherto been effected by three engines of the type originally made by Messrs. Pope and Son, with 6-inch pumps and 10-inch steam cylinders, 16-inch stroke. These compressors are now being replaced by larger and more powerful engines made at Swindon under the direction of the Chief Engineer (Mr. W. Dean). The pumps are 9 inches diameter, and the steam cylinders 15 inches diameter, with 24-inch stroke.

The gas is conveyed by mains $\frac{7}{8}$ inch inside diameter through the various sidings and carriage-sheds at West London, where the trains are cleaned, gassed, and formed ready for use, and are already laid about half the way to Paddington Station for supplying various sidings, &c., *en route;* ground or filling valves being provided at all points considered necessary. The hydrocarbon deposited during the compression of the gas is of a very inflammable nature, and flashes at ordinary temperatures. In order to ensure safety in dealing with this, a small tank, of the same strength as the high-pressure reservoirs, is placed underground, into which the hydrocarbon from the reservoirs is drawn as required; and when it has to be filled into iron drums for despatch, it is conveyed some distance in a pipe laid underground to a shallow brick pit, where the drums stand for filling. This work is only done in daylight. The storeage and handling arrangements are under the licence and approval of the Inspector of the London County Council. The make of gas about last Christmas time nearly reached 300,000 cubic feet, consuming over 4000 gallons of oil. Our oil supply is kept in tanks underground; and we have storeage for 7000 gallons.

The fuel used for heating the retorts is coal. The only product in the manufacture of oil gas, besides the hydrocarbon is the tar, which is not a generally marketable commodity. We have, therefore, adopted the plan of burning it for fuel, with a steam spray injector, which answers our purpose very well. We have had one special difficulty to contend with, which, in the recent stringent regulations adopted by many local authorities, other manufacturers of oil, or even coal gas, may have to face. We received complaints of nuisance from smell arising from the drains, into which the drainage from the gas-works was delivered, and were called upon to make our effluent water absolutely inodorous, or deal with the matter in some other way. I will not dwell upon the various schemes that were considered, such as filter-beds, settling-tanks, &c.; but eventually an arrangement was adopted which has met with the approval of the local authorities and has enabled us to deal entirely with our own drainage water, and absolutely sever and concrete up our connection with the London drainage system. Our arrangement is this: Two large iron cylinders or tanks have been sunk into the ground, side by side, into one of which the drainage is allowed to run. About 4 feet from the bottom is a pipe connecting the two cylinders together; so that, when the water is 4 feet deep in the first cylinder into which the drainage flows, it runs into the other cylinder in which the suction-pipe of the steam-pump is placed. An overhead tank, in two divisions to allow for cleaning, is also provided some distance away; and, at regular periods as may be required, according to circumstances, the pumps are set to work, and the drainage water is delivered into the high-level tank, which it reaches by an open trough channel, so as to obtain the assistance of the oxidizing action of the atmosphere. On reaching the tank, this water is mixed with an additional supply, to make up for what is used by evaporation in the steam-boilers of the works; but the smell is neutralized by the addition of finely-crushed permanganate of potash, placed in equal proportions in each of the cylinders and tanks, with the result that, at comparatively small cost, we have succeeded in overcoming what seemed a serious difficulty, and been enabled to comply with what many would consider unnecessarily harsh and stringent regulations. At any rate, we have found a way to meet the high standard of efficiency which is being demanded of manufacturers in the avoidance of nuisance, or of anything tending to interfere with the comfort and efficiency of the modern systems of sanitary science and hygienic conditions of life; and I think that, with the tendency of the times, any improvement that can be made in this direction is worth the attention of gas manufacturers, as well as managers of any other works, against which a charge of nuisance can possibly lie.

I trust that the further opportunities we are to be privileged with in the way of inspection of a modern works, with many specialities in plant and methods, may be found exceedingly interesting and instructive.

Mr. D. Irving (Bristol) said he had great pleasure in proposing that the thanks of the members be given to the President for his address. He was sure that all who had to prepare an address would sympathize and thoroughly endorse his remarks as to the growing difficulties Presidents of Gas Associations had to meet in preparing addresses which would present any new idea or thought. However, they were glad Mr. Riley (as they knew and expected he would) had given them an address which was characteristic of him. It was a record of his own experience and daily observation; and those were the things which it was necessary they should discuss when they met together.

Mr. Durkin seconded the motion, which was carried.

The President, in reply, said he was much obliged to the members for the way in which they had received his address. He had some little difficulty in knowing what ground to take, when he found that the addresses of Presidents of other Associations were coming out so rapidly. He therefore fell back upon items of his own experience which, he thought, might have a little usefulness and freshness as being slightly different to ordinary practice.

### FEDERATION OF GAS MANAGERS' ASSOCIATIONS.

Mr. Irving then introduced the above subject for discussion, by formally moving two resolutions which had been unanimously adopted by the Committee. Perhaps, he said, he ought to preface his remarks by saying, that, as far as he was concerned, no one had been consulted in the action that had been taken who was officially connected with The Gas Institute or the Institution of Gas Engineers. The first resolution was: "That this Association approve of the formation of a federation of the various District Associations, together with The Gas Institute and the Institution of Gas Engineers." The second resolution was one which practically sought to carry into effect the idea contained in the first. It was as follows: "That this Association cordially invites the several District Associations to appoint two representatives each, and The Gas Institute and the Institution of Gas Engineers four representatives each, to meet in conference at a meeting to be called in London in August or September next." Their President had so ably presented some of his (Mr. Irving's) arguments in favour of federation that it was scarcely necessary for him to take up the time of the members. He might, however, say that the idea had engaged the minds of many thoughtful men for some time past. The President had mentioned in his address that the question was before the South-West Association on a previous occasion, and that Mr. Carpenter had very warmly expressed his approval of federation in his address to the members of the Southern Association at their last meeting. As to the value of Associations of Gas Engineers and Managers, the opportunities they afforded for the exchange of ideas and experience, and the various contributions they had brought together year after year in their transactions, had been of the greatest advantage to the profession, and of great profit to the industry. The resolutions which he asked the members to pass (and which, as he had already said, had been unanimously endorsed by the Committee) sought to strengthen, by combining and consolidating, these various Associations. At the present time, there were eight District Associations, with a membership of 760, The Gas Institute with its 554, and the Institution of Gas Engineers with a roll of 118 members—these figures, of course, including associates, &c. Yet not one of the societies could be fairly said to be representative of the British gas industry, nor had they any connecting link or any means of organizing the combined influence and opinions of those engaged in this great industry. They did not, in the first place, propose, or even venture to draft, the foundations of this suggested combination, but now simply set in motion what they believed

would be a thoroughly representative Committee, which, they trusted, would loyally devote itself to the elaboration of a constitution that would be satisfactory to all reasonable men. Doubtless they would be told this was impossible. Their answer to this was that at any rate they meant to make an honest endeavour; and, while fully mindful of the delicate and difficult task they would have in bringing about the accomplishment of this federation, some of them at any rate felt satisfied that, if they could only get the Committee together, they might depend upon the wisdom and the good sense of the profession generally, to support any scheme that could be shown to be for the common good of the profession and in the interests of the gas industry. There was, he believed, a general opinion outside that they had too many meetings; and this was doubtless produced by the number of Associations that existed. He had in mind one gas company, some of the responsible officials of which were connected with The Gas Institute, some with the Institution of Gas Engineers, and others with District Associations. In such cases as this, it appeared to outsiders that, from April to September, they had a sort of monthly meeting; and so the Associations lost some of their legitimate weight and influence. Besides this, he thought there was a considerable waste of time, energy, and money in running rival institutions. Every thoughtful man knew there were scores of problems in their daily occupations in the manufacture of gas that wanted elucidating and needed investigation. They were surrounded with opponents in the electric light, cheap oil, and strong labour combinations; and there could be no doubt that, in the natural progress of things, the electric light at least would become more powerful. He now ventured to say that, instead of running rival institutions, they would be better employed in seeking to cheapen or improve the manufacture of gas. There could be no doubt that, in these rival institutions, one could only succeed at the expense of the other; and the Committee of the South-West Association were hopeful enough to think that, if they could only get a representative Committee together, that of itself would be a good step towards the object in view—the reunion and federation of all the Associations. A national federation, having the entire support of the profession, would naturally receive the confidence and support of corporations and companies owning gas undertakings; and if the federation could show it was doing useful work, there would be no difficulty in obtaining means for carrying on all profitable investigation. Thus a large national representative organization would command not only respect and confidence, but would be promoting good feeling and brotherhood, which would be far more profitable in these busy days than in spending their energy, time, and money in generating disunion and bad feeling. No doubt a great deal more might be said in favour of these resolutions; but there was only one other suggestion he wished at this stage to make, and that was that it was very desirable no expressions should be made in this discussion which would be likely, even in the slightest degree, to give offence, or make future negotiations difficult, or probably impossible. It would be well to begin with a kindly consideration for everyone, as far as possible.

The PRESIDENT said he had referred to this subject in his address without any idea of what was in Mr. Irving's mind. Before the question was introduced at the meeting of the Committee, he had put his remarks on paper in rough form; and he had therefore much pleasure in seconding the resolutions. He noticed that Mr. Carpenter, the President of the Southern Association, was with them; and as he had already expressed himself with reference to this matter, they would be pleased to hear a few words from him.

Mr. C. C. CARPENTER (Vauxhall) observed that he appreciated very highly the compliment the President had paid him in calling upon him to make a few remarks on this question of federation. His position was a somewhat awkward one, since he was at the meeting as a guest, and not as one of the members of the Association; and it would seem perhaps that he had no right to state there any opinions he might have on the subject, although the President had kindly given him permission to do so. That the existing order of things was quite wrong, there could be no two words. They might very well liken the position of the Associations to the condition of affairs that had operated in London before the districting arrangements came about. They had at that time several companies, with two or three sets of mains in the same streets, all seeking for customers; and in the gas industry they had now a very similar state of things—there was no national organization such as had been sketched out, but several, which could not combine in the best way the knowledge that was requisite to deal with the many subjects which were constantly coming up for discussion. He was sure, if the South-West Association were able to bring about such a federation as had been described, they would earn the thanks of the gas industry.

Mr. H. WIMHURST (Sleaford), the Secretary of the Eastern Counties Association, was next invited by the President to address the meeting. He could only say that, when the question came before his Association, he should have much pleasure in personally urging the Committee to give it all the support it deserved; and, being a member of the Council of The Gas Institute, he thought he could vouch for the same consideration from that body.

Mr. N. H. HUMPHRYS stated that he was strongly in favour of this proposed attempt at federation, for several reasons. For one thing, he thought it presented to them a means of bringing about a great saving of time and some saving of money. There were many present who were members of more than one Association, and who were paying subscriptions amounting to two or three guineas a year; but if a subscription of (say) two guineas a year were confined to one Association, he believed it would produce greater results than under the present condition of things. He had some sympathy with Mr. Irving in regard to the number of meetings that one was called upon to attend in the course of the year. In order to get away from home that day, he had to account for the existence of so many Associations. When he asked permission to come, he was reminded that he was away all day on the previous Saturday at a meeting in connection with The Gas Institute; and one day recently he was at the Southern Association meeting. It was then suggested that it would be a good thing if all the Associations could be made into one; so that he had come to the meeting in some measure prepared to hear the views that had emanated from previous speakers. As to the reference which had been made to the American Associations, they appeared to be in the same position as themselves—there was a large amount of machinery set to work, and the result was not adequate to the expenditure of time and money; and a combination or federation might do a great deal more useful work for the members and the profession at large. Something had been said about rivalry; and (he said it in the utmost friendly spirit—he was perfectly independent himself) it was no use denying that there had been a certain amount of party spirit. They did not want anything of that sort in the gas engineering profession. Anything like that must tend, not to assist and stimulate, but to hinder, progress. In another way they had been rather unfortunate in gas engineering—that was, they had no men of leisure as in other professions. In the Society of Chemical Industry and the Institution of Civil Engineers, they had men who had made money, and had a great deal of leisure on their hands, which they devoted to the advancement of the societies they represented. They had no one to take the place of these gentlemen in the gas industry; so that this was another reason why they should gain as much as they could from their Associations, which undoubtedly were giving the members good work and a great deal of benefit, but they ought to get this at the least possible cost of time and money.

The resolutions were then put to the meeting, and carried unanimously.

On the motion of Mr. LOWE, seconded by Mr. H. SAINSBURY (Trowbridge), the President and Mr. Irving were afterwards appointed to act as representatives of the Association at the proposed conference; but both those gentlemen expressed their willingness to retire in favour of Mr. Humphrys if he was not connected with the conference in some other capacity.

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Mr. W. STAGG (Bristol) next read a paper entitled "Notes on the Manufacture of Gas," which will be given next week.

At the close of the paper,

The PRESIDENT said they had had a very valuable contribution to their proceedings from Mr. Stagg. It had been taken from the field of his own experience; and he thought they might look forward to an interesting discussion upon it. He was, however, a little anxious about the time, as they had to pay a visit to the Kensal Green Gas-Works. He therefore suggested whether it would not be better to adjourn the consideration of the paper to the next meeting than have a hurried discussion upon it on the present occasion.

On the motion of Mr HIGGS (Basingstoke), seconded by Mr. DURKIN, it was agreed to postpone the discussion; and subsequently a vote of thanks was passed to Mr. Stagg.

### VOTES OF THANKS.

The PRESIDENT remarked that the building in which they were then assembled was attached to the carriage works of the Great Western Railway. The room had been placed at their disposal by Mr. Dean and Mr. Armstrong; and he thought they ought to pass a hearty vote of thanks to those gentlemen for the facilities they had granted to the members of the Association that day.

Mr. WHITE seconded the motion, which was carried.

The PRESIDENT said that the members ought also to record their thanks to the Directors of The Gaslight and Coke Company and to Mr. A. C. M'Minn, the Resident Engineer of the Kensal Green Gas-Works, for the permission which had been given to the Association to visit that station. He moved a resolution to this effect.

Mr. IRVING seconded the motion, which was agreed to.

A vote of thanks was also passed to the President for his conduct of the proceedings.

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### VISIT TO THE KENSAL GREEN GAS-WORKS.*

The members and a number of friends were then conveyed by breaks to the Kensal Green Gas-Works, where they were

* A paper on the installation of inclined retorts and labour-saving appliances at these works was read by Mr. M'Minn before the Institution of Gas Engineers in 1891 (see JOURNAL, Vol. LVII., p. 941); and, in the following volume (p. 309), an article appeared describing the locomotive steam-cranes in operation there.

welcomed by Mr. M'Minn. Before inspecting the works, the visitors assembled in one of the rooms attached to the offices to receive a few general particulars concerning the plant from Mr. M'Minn. He said that the works were capable of turning out 10 million cubic feet of gas per day. Last year the total output was 1351 million cubic feet; and 125,000 tons of coal were carbonized. During the latter six months, however, 127 million cubic feet of oil gas was produced; and they used 3300 tons of coke, including what was used for the boilers, in the oil-gas manufacture. In No. 1 retort-house, they had 426 retorts, or 852 mouthpieces, capable of making 4 million cubic feet of gas in 24 hours. No. 2 retort-house contained inclined retorts—476 mouthpieces—which were equal to a production of 3 million cubic feet per day. With these inclined retorts, they found that there was a saving in labour of about 7½d. per ton of coal carbonized. By the oil-gas plant, they could now produce 3 million cubic feet of gas in 24 hours. There were six sets of oil-gas plant, each set consisting of a generator, carburettor, and superheater; and these three vessels were capable of turning out 500,000 cubic feet of gas a day. The cost of labour in connection with the oil-gas plant varied from about 2d. to 2½d. per 1000 cubic feet of gas made, according to the time of the year; and the cost per 1000 cubic feet of 18 to 20-candle gas was from 16d. to 20d. The saving in the number of men required to work this plant was very considerable, when compared with ordinary horizontal retort working—of course, excluding engine-drivers and pump men in both cases. It took 36 men to work the whole of the oil-gas plant to make 3 million cubic feet of gas—that was, three shifts of twelve men—as against 138 men in the ordinary retort-house, or 46 men in each shift. This showed that 102 men less were needed in the case of the oil-gas plant to produce the same quantity of gas—being a saving of nearly 74 per cent. The new large gasholder had a capacity of 7½ million cubic feet. The tank was 250 feet in diameter; and 55 feet deep. The whole of the tank was constructed of Portland cement concrete, with thirteen tiers of hoop-iron bond built in. There were 2 feet of puddle at the back of the wall, the thickness of which at the bottom was 5 ft. 9 in., diminishing, by five offsets, to 3 ft. 3 in. at the top. The water capacity of the tank was about 11½ million gallons; and its cost was, in round figures, £41,000. The inlet and outlet pipes were of wrought iron, 48 inches in diameter. The holder was in three lifts, each having a capacity of 2½ million cubic feet. The total height of the standards was 165 feet. The rise of the crown was 18 feet. The strong plates were from $\frac{7}{16}$ in. to ¼ in. thick; and the main parts of the sheet weighed 5 lbs. to the square foot, or ⅛ inch thick. The cups were 1 ft. 9 in. deep. The cost of the holder was about £43,000; so that the total cost of holder and tank worked out to £11,419 per million cubic feet. The weight of the holder was 1095 tons; and of the framing, 1088 tons. In reply to questions, Mr. M'Minn said with regard to the inclined retorts, they were not at present in action; but he might say that the actual saving in labour of the actual drawing and charging was very nearly what he anticipated it would be—viz., 7½d. per ton of coal carbonized. Before, however, anyone adopted inclined retorts, he should recommend them to put up a trial setting, and have a meter attached, so as to ascertain the quantity of gas produced per ton of coal. His settings were on the plan first introduced by M. Coze; and, of course, great improvements had been made in inclined retorts since then. He was bound to say he was not altogether satisfied with the results from these settings. There was a deterioration in the quality of the gas; and he was not at all pleased with the make of gas. As to endurance, they had not had to re-set any yet; but it was not so great certainly as in horizontal retorts. In his case the heats had been rather high; and, in fact, they had to be to burn the coal off thoroughly. In reply to Mr. Irving, he added that it would not be fair to judge inclined retorts entirely by the system worked at Kensal Green, as there was no doubt great improvements had been made. They had now been brought out with through mouthpieces, without the bends at the back, and so on; but he had not met anyone yet who could give him definite figures as to the make per ton of coal carbonized. He also mentioned that the coal conveyors and grabs answered very well indeed; and the cost of working was only 0·6d., as against 4d. previously. Mr. Stagg inquired what was the reason the inclined retorts did not give such good results per ton of coal as the horizontal ones; and, in reply, Mr. M'Minn said he believed that every class of coal had a certain angle at which it could distribute over the retorts. One day they might be using fresh coal from South Yorkshire, dry and nutty, and, in a considerable percentage of the retorts, this would be distributed very evenly. Next day they might have to work Newcastle coal, which had been lying out in the open; and that would remain up in the bends and the tops of the retorts. He believed that, with the improved inclined retorts, they must use coal of a uniform quality.

The visitors spent some time in inspecting the works; the oil-gas plant and the inclined retorts, of course, claiming most attention.

Before quitting the premises, the President, in the name of the Association, thanked Mr. M'Minn for the preliminary information he gave them, and for the trouble he had taken during the inspection to point out the most interesting features of the plant under his care.

This concluded the day's proceedings.

## INFORMAL MEETING OF SCOTTISH GAS MANAGERS.

The Tenth Annual "Informal" Meeting of Scottish Gas Managers was held in Glasgow last Wednesday, under the presidency of Mr. A. Wilson, Manager of the Corporation gas-works at Dawsholm and Temple Farm. The meeting was, as usual, convened by Mr. J. M'Gilchrist, of Dumbarton; and there was a larger attendance than had been known for some years. This was doubtless due to the courtesy of Mr. W. Foulis, the Corporation Gas Engineer, in throwing open for inspection the works under his charge. Though Mr. Foulis gave a general invitation, Mr. M'Gilchrist felt that the time at the disposal of those who attended the meeting would not suffice for a visit to more than one works; and he selected those at Dawsholm. The wisdom of the decision lay in this—that, while the visitors were able to see the extensive additions which are in progress there, they also had the rare privilege of examining the new 6 million cubic feet gasholder which is being constructed at the Temple Farm works adjoining. The latter works, it may be remembered, were acquired from the Partick, Hillhead, and Maryhill Gas Company about two years ago; and as they were only separated from the Dawsholm works by the Forth and Clyde Canal, the Corporation have had a tunnel constructed below the stream, in which to lay mains and provide ready access from one works to the other. The tunnel, which is about 150 yards long, has just been completed; and the visitors walked through it, stepping roughly, in the darkness, over the sleepers of the railway which has been put down.

### Visit to the Dawsholm and Temple Farm Gas-Works of the Glasgow Corporation.

The company assembled at Macrae's Victoria Hotel, in West George Street; and, shortly after one o'clock, took train by the underground railway to Maryhill Station, from which they entered the Dawsholm works by the private line which serves the works. As they passed in, they were shown the two holders to which the accident occurred in January, 1891, and which have long since been repaired and in use. Proceeding down the circuitous slope of the railway, they came upon a busy scene, where workmen are at present engaged in the erection of a purifier-house and tar-well on a large scale. The work of constructing the purifiers alone, with the roof of the building, has been entrusted to the Barrowfield Iron Company, of Glasgow, at the contract price of £11,300. A little farther round, the visitors were brought to a stand opposite the existing purifier-house, the area of which seemed to strike some of them as stupendous. There are 24 boxes, each 26 ft. by 24 ft. Lime only is used; and the plant on some days last winter dealt with as much as 9½ million cubic feet of gas. Passing by the condensing and scrubbing plant, the visitors made their way into the new retort-house. Before the present extensions began, there were 832 retorts at the Dawsholm works. In the new house which has been erected, there are 512—raising the number to 1344. The retort-bench is in four sections, one of which was in use before the winter was over. The last section is in course of erection. One side of the building is at the present time merely a wooden screen; the intention being to put up another house in all respects similar to the one just finished, whenever the growing consumption requires it. The arrangements of the new house are in every way similar to those at the Tradeston works of the Corporation, which some of the members afterwards visited; and as the Dawsholm house is not yet fully equipped, it will be more convenient to describe these in connection with the Tradeston works. Leaving the new house, the company crossed over to the old one. Here they were joined by Mr. Foulis, who had been prevented from coming along with them by a business meeting in the city. Mr. Foulis fortunately came on the scene just as the visitors were about to examine his patent drawing-machine at work; and he was most attentive, both there and afterwards, in showing his visitors everything that was to be seen. The machine was acknowledged by all to do its work expeditiously, and as well as can be done by hand. As yet the charging at Dawsholm is performed by manual labour; but it is only a question of time when a full equipment of mechanical stoking will be established. Leaving the retort-houses, the company walked through the tunnel into the Temple Farm works, and reached the gasholder they had come to see. To the eye, the most conspicuous object is the guide-framing, the lattice-work standards of which, standing 138 feet high, are all but completed. The contractors for the ironwork of the holder are the Barrowfield Iron Company; but they sublet the erection of the standards to Sir W. Arrol's firm, who were able to bring to it men accustomed, from their experience upon the Forth Bridge, to work at a great height. Before leaving the ground, the visitors were, through Mr. Foulis's forethought, shown the method of raising one of the top girders into position. The holder itself is a three-lift one. Two of the lifts and the crown are practically completed; and the workmen are engaged upon the inner lift and the curb. Many of the visitors descended into the tank to its very lowest depth—46 feet below the surface—intent upon examining the lutes. To their inquiries as to the dimensions of the tank and holder, the reply was given that the tank (the excavation of which was, it may be remembered, performed by Mr. R. M'Alpine, of Glasgow) is 240 feet in diameter and 46 feet deep; that the outer lift of the holder is 236 feet in diameter and 45 feet deep;

the middle lift, 233 feet in diameter and 45 feet deep; and the inner lift, 230 feet in diameter and 46 feet deep; and that the crown is untrussed, and rises to more than 20 feet above the curb. General admiration was expressed at the proportions, as well as the workmanship, of the holder. As showing the expeditious way in which the work has been done, it may be mentioned that the excavation of the tank occupied less than ten months; that 9000 cubic yards of puddle, 2000 cubic yards of concrete, and some 4,000,000 bricks were used; that the holder, which is of steel, will weigh 870 tons, and the framing 1200 tons; and that the Barrowfield Iron Company only set to work upon it last September. After inspecting the works, the visitors were entertained by the Company.

Before leaving, Mr. M'Gilchrist asked the company to accord to Mr. Foulis their hearty thanks for his very kind invitation to them to inspect the works, and to the Barrowfield Iron Company for the trouble they had taken in connection with the visit. Mr. Foulis, in acknowledgment, said he was very gratified indeed to see his fellow-managers; and if at any future time Mr. Wilson wished to take them over the Tradeston station, or any of the other works they had in Glasgow, he should be pleased to conduct them, either collectively or individually. Mr. R. Laidlaw, the Managing-Director of the Barrowfield Iron Company, said it gave him very much pleasure to have the gas managers of Scotland there to see the third largest gasholder in the world. If the weather continued favourable, he thought they might be able to complete the work in about two months.

This brought the first part of the programme to a close; and the visitors, delighted with having seen works which will provide capacity for an additional output of 5 million cubic feet of gas per day to the station, took train to the city, and returned to the Victoria Hotel, where the business was transacted.

### The Meeting.

Mr. Wilson took the chair, and at once proceeded, without any formality, to say he thought the first matter they had to take in hand was the loss the gas industry had sustained through the deaths of Mr. Laurence Hislop, of Uddingston, and Mr. William Mackenzie, of Dunfermline. Mr. M'Gilchrist had just been telling him that Mr. Hislop had been a constant attendant at their meetings;, and Mr. Mackenzie was a Past-Chairman. He therefore thought those present ought to pass a vote of condolence and sympathy with the widows of these gentlemen, and to transmit the minute to them.

The suggestion was agreed to in silence.

The Chairman then said he had to thank his colleagues for having elected him to preside over the meeting. He did not expect such an honour when he came among them last year to make the acquaintance of a few of them. He was glad to say that they met under brighter auspices. Coal could again be bought at a price which, from their point of view, was more like a fair one; coke, although affected by the lower prices of coal, was in good demand; tar and ammoniacal liquor seemed to have touched the lowest point, and were now showing an upward tendency; and workmen had got over, at least for the present, a period of unsettledness, and were now more reasonable to deal with—the result being that the work went on smoothly, and was consequently better and more cheaply done. Altogether, he thought they might say that the prospects of the gas industry were improving. Their younger helpmate, the electric light, was still being pushed forward; and it would no doubt gradually find its own particular customers. But he did not anticipate that the gas industry would suffer much from its costly rival. This feeling seemed to be shared by the gentlemen who had the direction of the gas business in that city; for, although they had a large installation of the electric light, they were still extending the gas-works in all directions. The holder which, by the kind invitation of Mr. Foulis, they had had the opportunity of seeing that day was expected to be ready in July. In addition to this, they were putting down at Dawsholm apparatus for making an additional 5 million cubic feet of gas per day; and the buildings were so arranged that this quantity could be increased to 10 millions. The new retort-house was to be worked, as far as possible, by machinery. This meant a larger capital account; but, in these days of high wages and short hours, the saving in wages would be so substantial as to more than repay the outlay. In regard to the question raised last year as to whether or not gas took up water from wet meters, anyone could satisfy himself that it was merely a matter of temperature. Gas carried a certain quantity of aqueous vapour, corresponding to the temperature. If that of the meter was the same as that of the incoming gas, the latter would pass on without taking up any water; but if it was above, the gas would take up a certain quantity of water corresponding to the temperature, which would again be thrown down if that of the gas was lowered. The moral was to have wet meters fixed in a cool place. Purification was a subject which caused more anxiety to gas managers in the South than to them in the North. Still, managers in the North had their own troubles with regard thereto. This was, in many cases, owing to the small area of the purifiers, which caused the gas to pass through the lime at too great a velocity to allow the work to be well done. A little outlay on extra purifying plant was, in such cases, money well spent. The question of coal testing was at present to the front; and it was an important one, as it affected the reputation of gas managers. It pressed most heavily on those who had not the apparatus at hand for making working tests of coal. The directors or the gas committee generally believed what was stated in the analysis as supplied by the coalmaster, which was usually of a coal taken from a picked sample, and consequently gave an ideal value. When these analyses were compared with the actual working results, the directors or the committee were very much surprised to find that their manager had not been able to attain that ideal, but only something like three-fourths of the value of the coal; and consequently he generally had things made rather unpleasant for him. In larger works, little attention was paid to analysis sheets. The tests were made under actual working conditions; and they expected the results to agree fairly well with the actual value of the coal, as shown in every-day working. Perhaps the Committee of the North British Association, who had the matter in hand, would be able to suggest some method by which the working values of different coals might be obtained. If they had a standard photometer with a standard light in place of candles, it should not be so difficult to arrange to give coal some kind of a standard value such as might be expected to be realized in working. If this could be done in the same way that they had barometers, &c., tested at Kew, it would be much more satisfactory, both for the buyer and the seller of coal. The enrichment of coal gas by means of oil in place of shale or high-priced cannels was steadily gaining ground. In addition to the carburetting of the gas as it was being sent out from the holders, and the use of carburetted water gas, the Peebles system of gasifying oil for enriching purposes had of late been a great deal in evidence; so much so, indeed, that everyone who wished to be "up to date" in the use of oil had to make a pilgrimage to Peebles to see the process in use there. Without going into figures, as he understood they might be favoured in this respect by someone present who had gone into the matter thoroughly, he would like to say that the apparatus and the method of working it seemed to be simplicity itself. Whether it was the most economical one, seeing that a large proportion of the oil was vaporized and condensed several times; whether it was as suitable for foreign as for Scotch oils, because, unless this were the case, Scotch oil would soon rise to a fancy price; or whether the system was the best for use on a large scale—these were some of the questions that could only be settled by experience, and by a rather wider trial of the process. Having been accustomed for many years to 16-candle gas in the South, there did not seem to him to be great necessity for anything higher than 18 or 20 candle gas—in fact, he doubted very much if advantage was taken of the extra quality above this. If the enrichment could be done cheaply, or even if the extra candle power could be obtained at anything like proportionate cost, it might, in some cases, be better to reduce the illuminating power to that which could be produced by using soft coal and low-class cannels. In conclusion, he expressed the hope that the discussion might be as full as time would permit.

Mr. J. M'Crae (Dundee) moved a hearty vote of thanks to the Chairman. He said he did so with the more pleasure because Mr. Wilson was a comparative stranger to him. Judging by his appearance that day, he did not think he would be so to any of them much longer. His remarks had been particularly well selected.

Mr. A. MacPherson (Kirkcaldy) seconded the motion. He said Mr. Wilson had touched upon a considerable number of points in a very short time, and each of them was certainly highly interesting to them. He had told them that there was an installation of the electric light in Glasgow; but it was quite evident, from the great extensions they had seen that day, that the Glasgow Gas Trust were not yet quite prepared to be wiped out by the new light. As Mr. Wilson had said with regard to oil gas, it was a question whether the public of Scotland would be pleased to accept a lower quality. It seemed to him that all those who had been acquainted with 16 or 18 candle gas in the South favoured it. It might be prejudice; but he must say that they all had a preference for the higher power. Mr. Wilson doubted whether the advantage of the higher quality was obtained in burning. He thought this was a fallacy, and that it was only a question of burners. He had not yet had the privilege of visiting Peebles to examine the process which Mr. Young and Mr. Bell had produced there; but, from all the accounts he had heard, it appeared to be very successful, although, as Mr. Wilson had said, it seemed strange that it should be necessary to return the oil two or three times into the retort before gasifying it. They might eventually be able to overcome this. But, at any rate, it was a great step in advance; and he was sure they would all welcome it as a very great boon. The remarks Mr. Wilson had made with regard to water in the meters he thought stood to reason. He considered it was only right they should acknowledge Mr. Foulis's services that day, because he was more than kind in his attention to them.

Mr. J. M'Gilchrist (Dumbarton) thought the subject of the address might be divided into four heads. The first was capital charges—the great advantage that was to be derived by having the most improved plant. A great many directors, and even committees of corporations, were averse to the spending of money in capital; and he thought that was one of the greatest errors which could be, in connection with gas undertakings.

Unless they had proper tools, they could not do their work efficiently. The next point was coal analysis. They knew that this had been a grievous question among gas managers for many years. It was a matter that ought to be settled soon; and he was very glad to convey to them (perhaps it was a secret, but it would soon be made known) that the Committee of the North British Association that day formed themselves into a Research Committee, to go into the question of coal analysis, and to try to lay down a standard means of analyzing coal—a standard that would be acceptable to gas managers, and one that, he had no doubt, would be adopted by coal merchants, seeing that they would be put on the same footing. With regard to oil gas, he was glad they had with them Mr. A. Bell, of Peebles, who had given a great deal of attention to it. It was a question that deserved to be well considered by gas managers. He did not care whether he made gas from coal, or oil, or wood. He could hail any substitute for coal, if it were to raise the illuminating power without increasing the cost. Two years ago, when the price of coal was so high, this patent would have been a boon. The only thing he felt inclined to differ from Mr. Wilson upon was with regard to the illuminating power. He had all along held that it was light that people wanted, and not gas; and if they could produce a 25-candle gas cheaper than they could a 20-candle gas, he said it would be a fallacy to imitate the English people by having a lower quality. He thought it was begging the question altogether when people told them they could not get the proper illuminating power from 25-candle gas. Why, they could not get the proper value from 20-candle gas, without they used the means. Unless it could be shown that they could have a unit of light cheaper from 20-candle gas than from 25-candle gas, he would hold by the 25 candles; and he thought this oil gas was probably a means of continuing the high quality that had always been associated with Scotch gas-works. He might say he was sorry when he heard Professor Lewes, in his great lecture on Murdoch, recommend the people of England to reduce their low illuminating gas. That was, he thought, a sad reflection, not only upon the science of the age, but also upon the people engaged in the industry. The cry was "more light;" and if Professor Lewes could have shown them how to improve the light, rather than to reduce it, he thought he would have been more in the spirit of Murdoch.

Mr. A. Bell (Peebles) said he had much pleasure in rising to make a few remarks upon the oil-gas process, as worked at Peebles. These must, however, be short, so as not to anticipate what might be done at a future meeting. As every gas manager was aware, the increasing scarcity of cannel coal had made it necessary that a substitute should be found for it. There was an inexhaustible supply of paraffin and petroleum oils; and the attention of those connected with them had been directed to that source, with the result that several processes were in existence for the manufacture of gas from oil. But they had this drawback, that they were adaptable only to oils of low specific gravity. It was at once evident that, before oils could be economically applicable to gas making, the system must be capable of dealing with heavy oils. It was with the aim in view of finding such a process that Mr. Young instituted his experiments at Peebles; and the results had been entirely satisfactory. The Peebles plant, after an experience of six months, had, he was confident, overcome the difficulty. The process was so complete that it could deal with oils as heavy as coal tar, and convert them into gas and coke. That was, he thought, a most important point in these days, when they obtained so little for their tar. The plant at Peebles was exceedingly simple, and very much resembled that for coal gas. It consisted of an iron retort; and the gas passed off by an ordinary standpipe, and through a condenser and scrubber to the purifier. The oil was introduced into the iron retort by the standpipe. It was made to pass through the retort several times. The object of that was to reduce the temperature inside the retort, and to wash back any sooty matter that might be carried off; so that, after putting through a ton of oil, they had 22,000 cubic feet of gas, which had passed away, and 5½ cwt. of coke left in the retort. That coke they had sold at as high a price as £1 per ton. The process was, in fact, very similar to what had been practised for many years in oil-works, in the cracking up of heavy oils into lighter oils. What they had done was merely to carry that system farther. That was the reason for running the oil back, over and over again—in fact, it was more like a process of simple distillation than destructive distillation. He did not know that he could say much more without describing the plant in its place; but he would be very glad to explain this in practice to as many gentlemen as might find it convenient to go to Peebles.

Mr. MacPherson: How long does it take to put a ton of oil through?

Mr. Bell: It depends on the amount of gas you are making. We had two retorts at work in Peebles last winter; and each of these was capable of producing 10,000 cubic feet per day.

Mr. M'Crae asked how far the gas could be carried; and if there was any difference in the gas supplied from that sent out.

The Chairman: In other words, is there any loss between the works and the consumers' burners?

Mr. Bell: None whatever. The gas is even more permanent than cannel coal gas. In the six weeks of very frosty weather last winter, it was not nearly so much affected as coal gas.

Mr. M'Crae: What was the unaccounted-for gas?

Mr. Bell: The unaccounted-for gas in the corresponding quarter of last year was practically the same.

Mr. T. D. Hall (Montrose) said he did not want to interrupt this very interesting discussion; but there were one or two points he would like to notice. He was very pleased and gratified to hear a gentleman in the position Mr. Wilson occupied say that he was able to hold out brighter prospects for the gas industry. He had seen the electric lighting station in Glasgow, and felt that electric light had come to stay. When he viewed that large gasholder, he could not help thinking that gas would also remain. It would take about 600 tons of coal to fill that large gasholder with gas. Mr. Wilson had made some remarks about the presence of water in gas. This was brought forward last year; and from another year's experience, he could only repeat that all the water that was found in internal gas-fittings came directly from the meter. He had watched it very closely during the twelve months; and he must say that he had not had a single case of water, or jumping lights, in a house where the gas was measured by a dry meter. The testing of coal was an extremely difficult matter to deal with; and he did not know, really, whether or not a Research Committee would be able to arrive at any cure for that sad business. He was almost inclined to think that they would each have to depend upon their own resources to find out what was wanted. He had an idea that, if they could get the managers of large works, who had apparatus for practical testing at their disposal, to issue lists of well-known coal for the benefit of the gas industry in general, that would be one way of arriving at a standard; and they could discard all laboratory work whatever. Illuminating power was also a very important question. Having had a pretty large experience of manufacturing and consuming gas of low illuminating power, he was inclined to lean that way; but he would not put it so low as some dd. He would put it from 18 to 20 candles.

Mr. A. Yuill (Alloa) stated that he had agreed to introduce the Peebles process of oil-gas making; and he might mention that he had given the question a great deal of consideration. He went to Peebles on several occasions, and investigated the matter; and he prepared reports for his employers. There were one or two points brought out which were rather curious, and which, in his opinion, dispelled the idea of low illuminating gas. One gentleman had mentioned the cost per unit of light; that was brought out. The cost for oil and coal, using 8 per cent. of oil, amounted to 2·13d. per 1000 candles for 30·37-candle gas. If they took 24·13-candle gas, using less oil, of course, the cost per 1000 candles was 2·36d.; showing that they paid more per 1000 candles for the lower than for the higher quality gas. The cost of 24·22-candle gas from coal and shale was 2·54d. per 1000 candles, against 2·13d. for 30·37-candle gas from coal and oil. The higher the illuminating power they obtained from coal and shale, the more the cost rose. Did not these figures prove conclusively that the lower illuminating power gas from coal and oil cost more than the higher? If they took the sperm value obtained for a penny, they found, in the case of coal and oil, that of 30·37-candle gas they had 8·03; if they took 24·22-candle gas from coal and shale, they got 6·65—again showing that it cost less to give the higher illuminating power gas. Therefore, he held that it was more economical to make the higher illuminating gas. The cost of production also stood in the same ratio. To manufacture 30·37-candle gas from coal and oil cost 9·98d. per 1000 cubic feet; and to make 24·22-candle gas from coal and shale, 9·98d.—just the same. These figures were based on prospective reductions in price; and the cost of coal and oil was on the cost of coal at the present time and the latest quotations for oil.

Mr. MacPherson said he was favoured the other day with a circular from a Mr. Laing, who was also, he believed, working out an oil process. From the rude sketch he sent, it seemed that he put the oil into a boiler. From that boiler he led the vaporized oil away by a neck perhaps 2 feet in diameter, which he filled with scrap iron; and the furnace gases, after vaporizing the oil in the boiler, also superheated this neck. The gas then passed on to the scrubbers and condensers in the usual way. He did not know if the system had ever been tried in practical form; but he simply mentioned this, so that if any gentleman there was not aware that such a process was being brought out, he might be made acquainted with it.

Mr. P. B. Watson (Falkirk) asked how much it would cost to enrich to 26 candles.

Mr. Yuill replied that 1 per cent. of oil raised the illuminating power one candle. If they wanted to raise 18-candle gas to 25 or 26 candles, it would take about 8 per cent. of oil.

Mr. M'Crae inquired if Mr. Yuill would say that to raise 15-candle gas to 16½ candles would take the same percentage of oil as to raise it from 27 to 28 candles.

Mr. Yuill said his paper, which he had handed to the Chairman, would show that.

Mr. MacPherson thought that Mr. M'Crae's question was being misapprehended.

Mr. M'Gilchrist said he expected that Mr. Yuill gave the 1 per cent. as an approximate figure.

Mr. Yuill did not say it would be found in every case.

Mr. M'Crae said that, if they took Scotch splint, they would get 15½ candles; but if they used Scotch cannel, yielding 26 to 27 candles, would they get one candle then for 1 per cent.?

Mr. YUILL did not think those present would for a moment think of taking to oil if they were using rich cannels.

Mr. M'CRAE: I am merely asking a question.

Mr. YUILL: I am not prepared to answer it.

Mr. MACPHERSON: I think that is inconsistent of Mr. Yuill, because his quotations have been all up among the 30's.

The CHAIRMAN thought they might let the matter rest till the North British Association meeting, when, he understood, Mr. Bell was to give them a paper on it.

Mr. WATSON repeated his question.

Mr. BELL replied that they had been raising the candle power of splint coal gas up to 30 candles all the winter; and it had been costing them, for coal and oil, 14½d. per 1000 cubic feet, which was from 8d. to 10d. less than could be done with cannel coal and shale.

A question was asked, whether there would not be an excess of the vitiation of the atmosphere by the combustion of oil gas, seeing there were the carbon compounds in oil gas.

Mr. BELL said there was no difficulty in burning the gas, if they had a proper burner. They had a few complaints in Peebles until the burners were changed; but they had none now.

The CHAIRMAN, in closing the discussion, replied to one or two of the observations which had been made. Dealing with the subject of oil gas, he said there could be no doubt that, as they went higher for extra candle power, the oil must cost more.

Mr. YUILL begged to be excused; the very opposite was the case. The higher they went with coal and oil gas, the cheaper it was per unit of light. If they took coal and shale, it was the reverse.

The CHAIRMAN said that what he wanted to impress upon the meeting was, that it could not cost so much to raise gas from 16 to 22 candles as to raise it from 16 to 28 candles. To raise gas from 15 to 16 candles, could not cost so much as to raise it from 27 to 28 candles, because there was actually more sperm value in the latter.

Mr. YUILL referred to his paper, to show that the more they went down in illuminating power with coal and oil, the higher the cost was.

The CHAIRMAN said that did not seem to him to be feasible.

Mr. BELL substantiated what Mr. Yuill had said, that the richer the oil and coal gas was made, the cheaper it was to the consumer. It was a little higher to the maker; and the reason was that the cost of oil gas per 1000 candles was actually cheaper than the cost of splint coal gas per 1000 candles, and, by increasing the illuminating power, they were actually raising the cheaper oil gas to the dearer coal gas.

The CHAIRMAN understood it to be this: The oil gas was so cheap, that the higher the illuminating power, it was so much in favour of the total gas; but all the same, it seemed to him that the sperm value of one-candle power (say) from 26 to 27, instead of from 15 to 16, must be very much higher.

Mr. YUILL pointed out that the figures he quoted were based on the practical working at Peebles—they were not his.

The CHAIRMAN said there was a little bit of misunderstanding; but it would be cleared up at the North British meeting.

Mr. M'GILCHRIST then proposed that Mr. Thomas Wilson, Manager of the Coatbridge Gas-Works, be appointed Chairman of next year's meeting.

Mr. M'CRAE seconded the motion; and it was agreed to.

The CHAIRMAN having acknowledged a vote of thanks which had been accorded to him, the proceedings, which had lasted about an hour, terminated.

The gentlemen afterwards dined together in the Hotel.

### VISIT TO THE TRADESTON GAS-WORKS.

Some of those who attended the meeting visited the Tradeston Gas-Works in the evening, or on the following morning. The station has been almost entirely rebuilt since it came into the hands of the Corporation; and it is probably now the best-equipped gas-works in the kingdom. The retort-house contains 816 retorts, in three double benches. The firing is on the Siemens system. It is, however, in the arrangements for mechanical stoking that the chief merit of the place is to be found. This is done—both charging and drawing—by machines which have been devised by Mr. Foulis and Sir W. Arrol—the charging-machine by the two gentlemen in combination, and the drawing-machine by Mr. Foulis alone.* The coal-store is at the end of the retort-benches. An elevated railway running at right angles to the benches, brings the coal into the works. It is sent down a shoot into the coal-breaker, which is situated on the ground level; and it is driven by a steam-engine, situated in the basement floor. The same engine works an elevator, by which the broken coal is carried to nearly the roof of the house, and deposited in a large storeage-box, with hopper arrangement, capable of holding 20 tons. There is on the charging-machine a fixed hopper, made to contain 5 tons, which is equal to serving 40 retorts. Having been loaded from the box, the machine is brought in front of the setting to be charged. At intervals along the house, there are flexible hose hanging from the rafters, which convey the hydraulic power by which the machine is worked. One of these is attached by a simple catch to the machine; and the man in charge, by the use of a couple of levers, has then full control over its movements, in so far as they are not automatic. The charging is accomplished by a series of thrusts. A long arm with a plate attached, like the head of a rake, is sent into the retort to within nine inches of the back. On being withdrawn, it, at the end of the stroke, works a lever, which operates upon a drum in the bottom of the hopper, and releases a certain quantity of coal, which falls into position. The next thrust of the arm sends this coal to the back of the retort. On being again withdrawn, the same quantity of coal is released; but the arm this time, by means of an automatic arrangement, when it is again thrust in, stops short of the length of its former journey by a specified number of inches. On each succeeding journey, it does the same, until, on the last occasion, it stops just inside the mouth. Six thrusts are sufficient to charge a retort. Each oven contains eight mouthpieces; and the time required to serve the whole is 6 minutes. The coal is laid as evenly as by hand. The drawing-machine works similarly. It had, however, this beautiful arrangement, that the waste water from the hydraulic appliances is made to spray upon the rod of the rake, thereby keeping it cool; and after serving that purpose, it falls upon the coke which has been drawn, and extinguishes it. The operation of drawing eight retorts occupies about 6 minutes. By a peculiarly-shaped hopper arrangement, the coke, as it falls from the mouthpiece, is conveyed by shoots to the basement floor, where it is deposited in shallow trucks; and these are then drawn out upon an underground railway to the coke heap, by a diminutive locomotive engine, in all respects like an ordinary railway locomotive, but so tiny that the top of the funnel is not more than 5 feet from the ground. The gauge is a 2-feet one; and the appearance of the "pony" engine drawing its load, has a trifle of the amusing in it. As was remarked, it was more like a big dog than an engine. By the use of this arrangement, the floor of the retort-house is kept clear of all the customary barrows and trucks; and the way is left free for the passage of the charging and drawing machines. When it is required to charge a producer, another form of hopper is placed in front of the oven, which collects the falling coke, and directs it to the charging door. A significant feature of the retort-house is the absence of the crowds of workmen who used to be employed, and whose places are now taken, and their work done, much more silently and expeditiously than they were ever able to perform it. For the purpose of supplying the hydraulic power, a steam-engine is stationed in an out-of-the-way corner of the basement floor. It works quite automatically—starting, stopping, and regulating its speed to suit the work which may be required of it at the time, no one going near it, except to oil it. The purifier-house is capable of passing 6 million cubic feet of gas per day. In it, there is an ingenious and handy device of Mr. Foulis for the removal of the covers, which is also a feature of the Glasgow Corporation Gas-Works. At each corner of the box is an upright-rod, worked by hydraulic power, by means of which the cover is raised to the required height. The upper edge of the lute is formed into a rail; and when the cover is raised sufficiently, a carriage is placed on the rail at each end, and the cover is lowered on to it. Then a connecting-rail is placed across the passage to the neighbouring box; and the cover is wheeled over upon the top of its neighbour, where it rests until the contents of the box have been dealt with. This arrangement does away with the customary block-and-tackle arrangements, and is found to work better. In all the works, the plant has been laid down with a view to easy extension. An additional retort-house can be built alongside the existing one; a double set of exhausters can be placed in the exhauster-house; the purifier-house may be doubled in extent; there is room in the meter-house for another station meter; and in the yard there is ample space for another large gasholder. Engineering skill could scarcely go farther than Mr. Foulis has carried it in the Tradeston works, and is carrying it in the Dawsholm works; and those who have been privileged to view them at this time, have seen appliances and arrangements which they must look upon as standing in the foremost line of their industry.

* These machines, in their original form, were described in the JOURNAL for Sept. 27, 1892 (p. 555); but considerable improvements have since been made in certain parts.

## WAVERLEY ASSOCIATION OF GAS MANAGERS.

The Sixty-fourth Half-Yearly Meeting of this Association was held in the Cross Keys Hotel, Dalkeith, last Thursday—Mr. J. BLACK, of North Berwick, in the chair. In view of the fact that the subject of the use of oil in the manufacture of gas was to be considered, there was a good attendance of members.

The minutes of the preceding meeting, held at Peebles in September last, having been read by the Secretary (Mr. George Taylor, of Jedburgh), this gentleman was unanimously chosen President for the ensuing year; Mr. Dunlop Smith, of Hawick, being appointed Treasurer and Secretary.

Mr. A. BELL, jun. (Peebles), then gave an address on the oil-gas experiments carried on by Mr. Young and himself at the Peebles Gas-Works. He explained at the outset that his object that day was not so much to make a speech as to give some practical remarks on the subject of the manufacture of oil gas. The scarceness of cannel coal had compelled gas managers to look for a substitute. On account of the cheapness of petroleum and paraffin oils, the attention of those interested had naturally been directed thereto, with the result that several different

processes were in operation. These had all been more or less successful; but they were subject to one defect—that only oils of low specific gravity could be used. It was evident, before an oil-gas process could be successfully and economically applied, that it must be capable of dealing with crude oils of high specific gravity, as it was these which constituted the greater part of the home and foreign supplies. It was with this object in view, that the experiments at Peebles had been undertaken. After an experience of six months, he could confidently say that the process had entirely overcome all the difficulties connected with making oil gas. The plant employed was exceedingly simple, and resembled very much an ordinary coal-gas plant. It consisted of cast-iron retorts, stand-pipe, hydraulic main, condenser, and scrubber. Mr. Bell went on to describe the process, by the aid of diagrams; showing plans of the plant being fitted up at Galashiels and Musselburgh. In regard to the illuminating power, he said, it was impossible to get at it directly; but by mixing five parts of 18-candle gas with one part of oil gas, the average of 30-candle power was arrived at—the difference between the 30-candle and the 18-candle gas being due to the oil gas, making it equal to 90 candles as an enriching agent. Since the end of November they had used common splint coal at 10s. 4d. per ton; and oil costing 40s. per ton. The following was the report for the month of December last:—

| Material Used, &c. | Cost. | Cost per 1000 Cub. Feet. | Cost in Dec., 1891 |
|---|---|---|---|
| Paraffin oil ('885 sp. gr.), 12 tons 2 cwt., at 40s. per ton. . . . | £24 4 0 | — | — |
| Bellfield splint coal, 75 tons 5 cwt., and Auchlochan, 59 tons 15 cwt. —135 tons at 10s. 4d. per ton . | 69 15 0 | — | — |
| Total weight of material, 147 tons 2 cwt. . . . . | £93 19 0 | 14·43d. | 20·88d. |
| Lime, 6 tons 12 cwt., at 14s. 9d. . | 4 17 4 | 0·74 | 0·83 |
| Manager's salary and wages . . | 32 11 6 | 5·00 | 5·07 |
| Total . . . . . | £131 7 10 | 20·17d. | 26·78d. |

| Residuals Produced. | Return. | Return per 1000 Cub. Feet. | Return in Dec., 1891. |
|---|---|---|---|
| Tar and liquor, 9100 gallons, at 2s. 8d. per 100 gallons. . . . | £12 2 8 | 1·86d. | 5·24d.* |
| Coke from coal, 34 tons 8 cwt., at 8s. 4d. per ton . . . . . | 14 6 8 | 2·70 | 1·82 |
| Coke from oil, 3 tons 5 cwt., at 20s. per ton . . . . . | 3 5 0 | | |
| Spent lime, 13 tons 4 cwt., at 1s. 6d. per ton . . . . . | 0 19 10 | 0·15 | 0·31 |
| Total . . . . . | £30 14 2 | 4·71d. | 7·37d. |
| Net cost of gas into holder. | £100 13 8 | 15·46d. | 19·41d. |

*Working Statement.*

| | | | |
|---|---|---|---|
| Oil gas made . . . . | 268,100 cub. ft. | = 22,157 cub. ft. per ton. | |
| Coal gas made . . . . | 1,293,000 „ | = 9,580 „ | „ |
| Total gas made . . | 1,561,400 „ | = 10,614 „ | „ |
| Do., Dec., 1891 . | 1,908,700 „ | = 9,780 „ | „ |
| Tar and liquor . . . . | 9,100 gallons | = 67·40 gallons p. ton of coal. | |
| Do., Dec., 1891 . | 11,500 „ | = 59·00 „ | „ „ |
| Coke from coal. . . . | 34 tons 8 cwt. | = 5·09 cwt. | „ „ |
| Do., Dec., 1891 . | 34 „ 15 „ | = 3·60 „ | „ „ |
| Coke from oil . . . . | 3 „ 5 „ | = 5·37 „ per ton of oil. | |
| Gas made since balance . | 6,502,600 cub. ft. | | |
| Do. for Dec., 1891 | 7,075,500 „ | | |

* The price of tar and liquor was only 2s. 8d. per 100 gallons in 1892, as compared with 7s. 3d. in 1891; being equal to a loss of 3·38d. per 1000 cubic feet of gas.

Dealing afterwards with the cost of plant, Mr. Bell stated that the erection at Peebles cost £140; and it was capable of producing 20,000 cubic feet of oil gas per day—making the cost equal to £7 per 1000 cubic feet of oil gas. In calculating the cost of plant for different works, it was safe to reckon from £7 to £10 per 1000 cubic feet of oil gas required per day.

In the course of the discussion which followed, most of the members expressed satisfaction with the result of the Peebles experiments.

Mr. A. Bell (Dalkeith) said that he had naturally watched all along with very great interest the experiments being carried on by his son at the Peebles Gas-Works. With regard to the price of coal, it must undoubtedly come down. At the same time, oil was rising in price. Were the larger gas undertakings, like those in Edinburgh and Glasgow, to introduce it, the demand would be far greater than the supply of this country; but he would remind the members that the quantity in Russia and America was unlimited. Even at £3 per ton, it would pay them to import it. Supposing they took oil at £4 per ton, it would be nearly as good an enricher as the Marquis of Lothian's cannel coal at 18s. per ton. He expected that before very long the Directors of the Dalkeith Gas Company would have the manufacture of oil gas begun. With oil gas they had the power of enrichment at a very low rate, and could compete with the electric light on more equal terms; so that, if people demanded gas of high illuminating power, it could be supplied at much cheaper rates than with first-class cannel coals, which were becoming scarcer and naturally higher in price.

Mr. W. Blair (Haddington) said he thought that gas managers, even though they might not adopt the process, were greatly indebted to the Peebles gentlemen, as they had been able by their experiments to cause the price of coal to fall; and they knew that cannel had gone beyond limits during the last few years.

Mr. R. M. Sutherland (Falkirk) remarked that, although scientific progress threatened to some extent to extinguish his particular occupation, he should not like to arrest it. They would all be pleased to hear the oil-gas process was a pronounced success. He thought, however, there was a little misapprehension in regard to the oil that was being used with it. It was what was called "blue oil," of ·884 specific gravity. This was a lubricating oil, which formed about 20 per cent. of the crude oil. The total production of crude shale oil in Scotland amounted to 50,000,000 gallons, or about 200,000 tons. If they were to confine themselves to the class of oil of ·884 specific gravity, they would only have something like 40,000 tons per annum. There was no doubt they could look to America, Russia, and other places, for an unlimited supply of petroleum or natural oil. The use of this particular oil would have a tendency to increase the quantity of shale oil in this country, and would make paraffin or burning oil more abundant. One of the difficulties of using crude shale oil was the presence of wax or paraffin, which necessitated the oil being kept at a temperature of 90° Fahr. Still, this was only a practical difficulty, and one that could be overcome. In using crude shale oil, they had the wax, which was one of the most valuable of constituents for the manufacture of illuminating gas. The more varieties of oil experimented upon for manufacturing gas, the more would the field be widened, and the success of the process ensured.

A Member remarked that Mr. Ivison Macadam had recently stated that 26-candle gas would give better results, with the burners at present in use, as it was more economical than gas of higher qualities.

Mr. Bell replied that he believed they had been supplying gas of too rich a quality; but he would not now be inclined to go so low as Mr. Macadam had recommended.

Votes of thanks closed the discussion; and the members afterwards dined together.

## THE ALEXANDER-PATERSON PROCESS FOR THE MANUFACTURE OF OIL GAS.

In our "Notes from Scotland" last week, reference was made to an article on the above subject which appeared in the *Glasgow Herald* on the 3rd inst. We had already received a communication on the matter, for which we had not space in the succeeding issue of the Journal, from a resident in Edinburgh; and, in view of the interest at present attaching to all processes for the manufacture of oil gas for the enrichment of coal gas, we now give it.

Messrs. Alexander and Paterson patented their process in March, 1885;* and the Patent Paraffin Gas Lighting Company, Limited, of Glasgow, was subsequently formed to work it. In carrying out the primary idea of supplying country houses with a simple and easily-managed apparatus for making gas of a superior quality from oil, they have been eminently successful. Recently, the attention of the patentees has been directed to a much wider field—viz., the production of an oil gas of very high illuminating power, specially adapted for enriching gas of lower quality made from coal. For this purpose their process has been found to be admirably adapted; and the most satisfactory results have been obtained.

Numerous trials have been made by mixing the enriching oil gas with Glasgow gas (which is of 20·04-candle power) in certain proportions. The results obtained (showing an enriching capacity of over 150 candles) have been very remarkable, as they proved that the enrichment was in a higher ratio than could have been anticipated from the addition of the oil gas in the proportions employed, and therefore its peculiar suitability for admixture with coal gas. The trials have been fully corroborated by Mr. R. R. Tatlock, F.R.S.E., Public Analyst and Gas Examiner for the City of Glasgow, in the following report:—

*City Analyst's Laboratory, Glasgow, March 15, 1893.*

On the 14th inst. I attended at the works of the Patent Paraffin Gas Lighting Company, with the object of testing the oil gas manufactured by them, and of the gas prepared by the mixture in various proportions with the Glasgow gas. The results I have obtained are embodied in the following table:—

| | Illum. Power in Standard Sperm Candles, calculated to 5 Cub. Ft. per Hour. |
|---|---|
| Glasgow gas . . . . . | 20·04 |
| Oil gas made by the Company. . . . . | 75·06 |
| Mixture of 1 part by volume of oil gas to 6 parts of Glasgow gas . . . . . | 39·30 |
| Mixture of 1 part by volume of oil gas to 9 parts of Glasgow gas . . . . . | 33·32 |

It will be seen that this oil gas is of very high illuminating power. The results show in both cases that there was a very large increase of illuminating power beyond what could have been anticipated by the mere admixture of oil gas with the Glasgow gas in the proportions employed. Thus, in the trial of 1 to 6, the average illuminating power of the component gases used should be only 27·90 candles; whereas the result obtained was 39·30 candles—a difference of 11·40 candles in favour of the mixture, over and above what could be expected from the mixture employed. The enriching power of the oil gas in this case was, therefore, equal to 154·86 candles—that is, mixed in the proportion of 1 with 6 of Glasgow gas, the illuminating

* It was described and illustrated in the Journal for Feb. 23, 1886 (p 352).

power of the mixture was exactly what would have been expected if the oil gas had been of 154·86 candle power. Or, to get the observed illuminating power, we should require theoretically to use, as nearly as possible, 1 part of the oil gas to 2 parts of Glasgow gas, which would give 38·38 candles. Again, the mixture 1 to 9 gives 33·32 candles; whereas, theoretically, the mixture employed should not have given more than 25·54 candles—a difference in favour of the mixture of 7·78 candles. The enriching power of the oil gas, in this case, was therefore equal to 152·84 candles. That is, mixed in the proportion of 1 with 9 of Glasgow gas; the illuminating power of the mixture was exactly what would be expected if the oil gas had been of 152·84 candles.

It is almost unnecessary to say that these are very surprising results, and form a strong argument in favour of the employment of such oil gas in admixture with coal gas, in order to obtain a large excess of illuminating power over and above what could be anticipated by the addition of oil gas for the purpose of enriching ordinary coal gas

(Signed) R. R. Tatlock, F.R.S.E., F.I.C., F.C.S.
Public Analyst and Gas Examiner for the City of Glasgow.

About 14·70 gallons of oil are required to make 1000 cubic feet of this enriching gas; the output being about 85 cubic feet per retort per hour. Taking the oil (an intermediate oil of ·865 sp. gr.) at 2½d. per gallon, and using coke for firing, the cost of oil, fuel, and labour is about 3s. 5d. per 1000 cubic feet. It may be mentioned that the oil gas, which apparently has a great affinity for coal gas, is not added to the latter till its manufacture is completed, when it is mingled with the coal gas in the holder, where the intermixture of the two gases appears to take place almost immediately.

The importance of such a powerful enriching oil gas may be estimated by looking at the effect it would have, both as regards price and quality, if mixed with ordinary gas made from coal. Splint coal, yielding per ton (say) 9500 cubic feet of gas of about 16-candle power, can be bought at present at about 9s. 6d. per ton. Taking fuel, labour, and lime at the average cost of making Edinburgh gas, this gas would cost about 1s. 5d. per 1000 cubic feet; and if 9 parts were mixed with one part of enriching oil gas, the result would be as follows:—

| | | s. d. |
|---|---|---|
| 9000 c. ft. coal gas, 16-candle power | = 144 c.p., at 1s. 5d. | 12 9 |
| 1000 „ oil gas | = 150 „ „ 3s. 5d. | 3 5 |
| | 10)294 | 10)16 2 |
| | 29·40 | 1 7·4 |

So that a gas of 29·40-candle power would be obtained at a cost of 1s. 7½d. per 1000 cubic feet; or, in other words, a coal gas of 16-candle power, costing 1s. 5d. per 1000 cubic feet, would have added to it 13·40-candle power at a cost of 2½d. per 1000 cubic feet. The gas so obtained would not only be cheaper than a coal gas of a much lower candle power, but the public would have the benefit of a much more beautiful light, and at the same time of a purer quality, as the oil gas is almost entirely free from sulphur.

The apparatus employed is very simple and compact—occupying little space; and it can be erected at small outlay. No washers or purifiers are required; and lime is entirely dispensed with. In working it is almost automatic—no charging or drawing of retorts being required; so that the cost for labour is comparatively trifling.

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**Loan for Gas-Works Purposes at Salford.**—In the minutes submitted by the Gas Committee at the meeting of the Salford Town Council last Wednesday, it was stated that the Local Government Board had sanctioned the borrowing of £13,456 for gas-works purposes; this sum representing the amount of overdraft at the bank, and to be repaid with interest within a period of fifteen years.

**The Electric Lighting Scheme for Belfast.**—At a meeting of the Belfast Corporation in committee last Tuesday, it was resolved to adopt so much of the report of Professor Kennedy on electric lighting as the Gas Committee approved, and to take steps with regard to the erection of the central station. The principal portions of the report were given in the Journal for the 28th ult.

**The Electric Lighting Scheme for Kingston.**—Last Wednesday week, Mr. Arnold Taylor, C.E., held an inquiry at Kingston, on behalf of the Local Government Board, into an application by the Town Council for permission to borrow £16,000 for the purpose of electric lighting in the borough. The Town Clerk stated that the sum required was made up of £11,850, the amount of the tender of Messrs. Siemens, which covered everything, except the erection of the central station. The balance of £4150 was intended to cover the cost of the buildings and other capital expenditure, if any. Provision was made for 5000 incandescent lamps and 35 arc lights. The population of the borough at the last census was 27,057; and the rateable value, £125,601. The total of the present outstanding loans was £58,575; and there was £5000 borrowed on the security of certain property. Mr. Preece, jun., gave evidence as to the system adopted and the machinery to be used; and he said it was estimated that, *if* the 5000 lamps were fixed, they would be able to show a profit of £100 on the first year's working. That was all that could be done with the present plant; but, as occasion required, the supply could be increased by adding to the generating machinery—the mains being capable of distributing more than double the supply now arranged for. Mr. Clarke, a member of the Council, opposed the application; and he pointed out that at Northampton, although the light had been established there four years, they had only 4000 lamps fixed, and at Oxford the Corporation could not be induced to adopt the light, because it was so unreliable. Some conversation followed with respect to the amount of the rates in the borough; and the inquiry then terminated.

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Bills read a second time and committed: Dublin Corporation Bill; Electric Lighting Provisional Order (No. 1) Bill; Wolverhampton Gas Bill.

Bills reported: Blackpool Improvement Bill; Rathmines and Rathgar Water and Improvement Bill; Stockton-on-Tees Corporation Gas Bill.

Bills read the third time and passed: Barry and Cadoxton Local Board Bill; Brighton and Hove Gas Bill; East Stonehouse Water Bill; Plymouth Corporation Water Bill.

The Standing Orders Committee reported that the Standing Orders ought not to be dispensed with in the case of the petition of the East London Water Company for leave to deposit a petition for a Bill referring to certain Lammas Lands at Leyton.

A petition was presented from Royal and Parliamentary Burghs of Scotland for an alteration of the law in regard to the rating of waterworks.

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## COURT OF REFEREES.

### The London County Council and the Constitution of the Thames and Lea Conservancy Boards.

Last Tuesday, the Court of Referees in the House of Commons sat, under the presidency of Mr. Shiress Will, to consider applications of various petitioners for *locus standi* against the General Powers Bill of the London County Council. The measure provides (*inter alia*) for the representation of the Council on the Thames and Lea Conservancy Boards; confers powers with respect to the Council's procedure, investigations, and negotiations on various subjects, and also in regard to electric lighting; and confers certain powers on Vestries and District Boards. The first applications considered were those of seven of the London Water Companies; the East London Company petitioning separately as well as joining in the associated petition.

Mr. Pember, Q.C., on behalf of the applicants, stated that they asked to be heard in respect of the clauses which gave the Council representation on the Thames and Lea Conservancy Boards. Clause 3 of the Bill provided that the number of Conservators on the Thames Board should be increased from 23 to 30 by the addition of seven representatives of the London County Council; clause 5, that the number of Conservators on the Lea Board should be increased from 13 to 15, by adding two more representatives of the Council to the one they already possess. His clients also asked to be heard on clause 15, which gave the Council power to spend money in obtaining advice and assistance in making investigations and carrying on negotiations on any subject in the public interest. Consequent on this clause were clauses 28 and 30, the first of which empowered the Council to expend on capital account £10,000 in carrying out the purposes of the Act; and the second providing that all costs and expenses of the Council in the execution of the Act (except as otherwise provided for) should be defrayed as payments for general county purposes. It was agreed that clause 28 was only to refer to electric lighting; and therefore, under clause 30, the Council had power to spend an unlimited sum of money on investigations. There was no doubt that investigations into the water supply of London were intended. These were hostile to the interests of the Water Companies, and were, in fact, a move in the game of opposition to them.

Mr. Freeman, on behalf of the County Council, said there was nothing in the Bill to injure the interests of the Companies.

The Court decided to allow the *locus standi* of the petitioners with respect to the two Conservancy Boards; and to disallow it with regard to the expenditure on investigations. Further, the *locus standi* of all other petitioners at present interested in the constitution of these Boards would be allowed in respect of the clauses referring to them.

The *locus standi* of the county borough of West Ham, of the County Council of Essex, of the Surrey County Council, and of the representatives of the Upper Thames on the Thames Conservancy Board was admitted, after some argument. The application of Sir Gilbert East, a riparian owner, was granted; as was also that of the London Corporation and the Commissioners of Sewers, as owners of property which might be affected by the Bill.

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## HOUSE OF COMMONS COMMITTEE.

(*Before Mr.* H. J. Roby, *Chairman; Sir* G. Chesney, *Sir* J. Kitson, *and Mr.* Mildmay.)

### Thursday, March 23.

BRIGHTON AND HOVE GAS BILL.

At the close of the promoters' case, as given in the Journal last week,

Mr. Cripps said, before calling his witnesses, he proposed to put his points before the Committee, as he thought this might possibly narrow the issues, and enable them to keep the evidence as close as possible. He claimed, on behalf of the Corporation, that they were doing nothing worse than putting forward, from the consumers' point of view, what was regarded as fair and proper; and he was quite as anxious that the shareholders should be properly protected as the Company, on their part, seemed to be that the consumers should be properly considered. It was said, though without any shadow of principle to support it, that, where the sliding scale and the standard price had once been adopted, it was a settlement of the matter for ever. But immediately the promoters left this position, they had what he might call the "common form" contest as to whether the proposal of the Company or that of the Corporation was in itself a fair and proper one. Mr. Littler suggested, in his opening statement, that there had been some settlement, in the year 1881, with regard to the

questions of price and illuminating power, which must be held to have decided for all time the position as between the consumer and the shareholder. But what happened in that year was what frequently occurred in committee rooms—viz., an arrangement was made with reference to a particular Bill; and, if the Company were not asking for fresh principles, there would be no reason whatever why this arrangement should be upset.

The CHAIRMAN remarked that the Committee were of opinion that the Corporation were not debarred by the agreement from reconsidering this question.

Mr. CRIPPS said he agreed that the question of principle was of some importance, because he was of the opinion of Mr. Woodall, that there was no precedent for what the Corporation were now asking; but, as the particular point had never been discussed before, he should claim that there was no precedent either way. As regards all gas companies, the principle was to find a maximum price and dividend. For example, there would perhaps be a maximum price of 4s. or 5s.; and in the case of old companies, it was almost universal to allow a maximum dividend of 10 per cent. Then the sliding-scale system was adopted; and no doubt the chief contest between companies and local authorities had been as to changing from the maximum dividend price to the principle of the sliding scale and standard price. Whenever this alteration had been made, the question of price and illuminating power had been thoroughly discussed in reference to the special conditions. He apprehended that there was no difference in the present case from what he might call the old principle. It could never have been intended that, because the principle of maximum price and dividend had been changed into sliding scale price and dividend, the alteration should be binding for all time as against the consumers. It was only an alteration in the method of charge. The Corporation were not seeking to interfere with the proper interests of the shareholders, with the security of the capital, or any point of that kind. There was no such thing as was suggested on the other side—viz., a parliamentary bargain lasting for all time. Dealing with the particular matters raised, he said there were three points to be discussed on the preamble—the first being with regard to the amount of capital sought. Capital was only given for a limited term, in order that the particular questions they were now raising might be properly discussed from time to time. This was an absolute principle. It was suggested by the promoters that the £375,000 for which they asked would keep them out of Parliament for fourteen or fifteen years. This appeared to be a grossly exaggerated estimate; and the witnesses he would call would state that £200,000 of share capital would be ample.

The CHAIRMAN inquired if £200,000 share capital and £50,000 loan capital would be enough for the promoters.

Mr. SAUNDERS replied that he was afraid it would not.

Mr. CRIPPS said no one, looking at the matter from a business point of view, could doubt that £200,000 would suffice for the next ten or fifteen years.

The CHAIRMAN said the Committee had had no evidence with regard to the amount necessary for completing the existing works.

Mr. CRIPPS said he omitted to ask that question; but perhaps Mr. Cash would tell them.

Mr. *Cash* said the amount the Company would want to complete the work now in hand would be £29,000. They would require £28,000 to finish the third section; and before the exhaustion of the capital power they were now asking for, they would further enlarge their works to the extent of £74,000.

The CHAIRMAN: I understood that your capital powers were already exhausted.

Mr. *Cash* said that was so; but he understood the question to refer to the cost of the works.

The CHAIRMAN: You say that to complete those works would cost £57,000. How much has been overdrawn at the bank?

Mr. *Cash:* £25,000.

Mr. CRIPPS pointed out that the Company would only require £60,000, apart from any working capital, when the three sections were completed; and this would, he said, be ample to provide for fifteen years, when, of course, it would be the right time to come to Parliament again. But although this was only £60,000, the Corporation were willing to allow what was considered to be the very handsome margin of £200,000, to provide for all contingencies.

The CHAIRMAN: Do you suggest £200,000 as capital and loan?

Mr. CRIPPS: To include everything.

A MEMBER remarked that this would leave £140,000 after they had paid off their indebtedness.

Mr. CRIPPS admitted this; adding that the Corporation thought it was ample margin. He then dealt with the subject of illuminating power, and contended that the evidence already given proved that 15 candles would be a standard for the future. With regard to the point as to the sliding scale and the standard price, a company who were asked to give a high illuminating power might at the same time, no doubt, if the conditions allowed it, ask for an increased standard price, because they would be supplying gas at additional cost; but in the present case the Corporation thought there was a good margin both to raise the illuminating power and lower the price of the gas. The present standard price was 3s. 3d.; but his witnesses would say that it might be reduced to 2s. 9d. without injury to the Company in any way. Taking the figure at 2s. 9d., it appeared that last year the Company had to draw a considerable amount—something like £12,000—from their undivided profits, from which it appeared that up to recent years they had been getting 10½ per cent., and carrying forward a very large sum. The real point was this: Could the shareholders be fairly protected, and be put in what he might call a fair and proper position, with a reduction of the standard price to 3s. or even 2s. 9d.? He thought that they could, as there was nothing to show that the shareholders could not get their 10 per cent., and something more. It was absurd to suggest that the Corporation were seeking to interfere with security, or anything of that kind.

The CHAIRMAN: Practically, the questions between you both are simply the amount of capital, and the conditions to be imposed with regard to the candle power and standard price.

Mr. CRIPPS: Yes; I think all the other matters can be raised on the clauses.

The following evidence was then given on behalf of the opponents:—

Mr. *A. Silverthorne*, examined by Mr. BACGALLAY, said he was first consulted by the Brighton Corporation in 1889 with regard to the gas-works. He made a report to the Corporation upon data furnished to him, and advised them generally with regard to the prospects of a reduction in price. It amounted to 2d. per 1000 cubic feet. He reported upon the low standard of illuminating power, and also upon the charge for gas, which then amounted to 2s. 11d. He commented very strongly upon the standard, which was lower than usual. In the following year, the price was reduced from 2s. 11d. to 2s. 9d. He had heard it stated that the rate of production of gas in Brighton was increasing at about 4 per cent. yearly; but he did not find this to be quite accurate. It was what he might call a "decremental rate" of increase. He might put it in this way: In 1859, the supply was 71 millions. It doubled in seven years; and in 1866, it was 150 millions, or an increase at the rate of 10 per cent. The next period was between 1866 and 1878, in which the rate was 6 per cent. compound. Now, there seemed to be another process of doubling going on between a period which he should estimate as twenty years, because there were only twelve years of it completed; but it pointed to 3·6 per cent. compound increase. He had no doubt the compound rate of increase might be put at 3½ per cent. If this were done, he calculated that the works would be exhausted in about sixteen years. When the third section was completed, the additional production of gas would be sufficient for the next sixteen years. The producing capacity of the first and second sections was 864 millions. He did not know of any town similarly situated to Brighton which had so low an illuminating power as 14½ candles. The margin was generally greater, as managers were very cautious, and did not wish to expose themselves to the charge of supplying an inferior quality of gas. The tendency in large places was unquestionably to give as much light as the coal was fairly capable of affording; and no doubt this was in excess of 14 candles. Several places had 16, and one 15½ candles. He was dealing exclusively with sliding-scale cases. The standard of 14 candles was applied at Bradford, Brighton, Exeter, Tottenham, Croydon, Eastbourne, Portsea, Wandsworth, and Plymouth. If the Committee sanctioned an increase in the illuminating power, it would be necessary to restrict the production of gas per mouthpiece; but there were many ways in which it could be operated. He thought, if an increase to 15½ candles were given, it would have the effect of reducing the limit to twelve years. His opinion was that the Company should be confined entirely to the use of Durham coal, without attempting to add cannel to it, which in his opinion was a great mistake. At Brighton, they produced something like 11,257 cubic feet of gas from a ton. In London, only 9900 cubic feet were obtained; and a fraction of cannel was added in order to bring the gas up to 16-candle power. That fraction was about 1 per cent.—sometimes less. He had advised the Corporation not to press for 16 candles, in order to obviate the addition of even a small quantity of cannel. He believed gas engineers would agree with him that it was better to put cannel aside, and to deal with the coal entirely on its own merits. He practically agreed with Mr. Cash as to the cost of finishing the third section of the works at Portslade. He had allowed £41,600 as capital expenditure for completing the storeage. For additional land he had allowed £47,400; and £10,000 for new mains, meters, and stoves. In addition to this, he had added the usual 10 per cent. for contingencies; making a total of £183,700. This amount would be sufficient for the next twelve or sixteen years, during which time the third section of the works would suffice. The cost of giving an increase of 1½ candles, so as to raise the illuminating power to 16 candles, would be about 1½d. per 1000 cubic feet, and the extra cost would amount to £4614. He had prepared a statement showing how these figures were arrived at; and he would hand it in. It was as follows:—

*Increased Cost of Supplying 15½-Candle Gas.*

To supply 15½ to 16 candle gas, you may either take 10,000 cubic feet of gas out of a ton of Newcastle coal with a slight admixture of cannel (say, under 2 or 3 per cent.), or else confine the production to 9700 cubic feet per ton of coal without cannel, which is the best plan. The cost of doing this at Brighton would be as follows: To produce, as in 1891, 950,294,000 cubic feet of gas, then done at the rate of 11,287 cubic feet to the ton, this same quantity would require 97,968 tons upon the scale of 9700 cubic feet per ton. This, it will be noticed, furnished an increase of 13,773 tons. The coals, including trimming, are down in the 1891 accounts at 14·13s. per ton.

| | | |
|---|---|---|
| 13,773 tons, at 14·13s. per ton | | £9730 |
| Deduct value of residuals, 13,773 tons, at 8·10s. per ton | £5578 | |
| Enhanced value of coke due to less exhaustion—say, 93,430 chaldrons, at 6d. per chaldron | 2260 | |
| | | 7838 |
| | | £1892 |
| Add for extra labour, 13,773 tons, at 2·96s. per ton | | 2034 |
| Add for renewal and maintenance (retorts), 13,773 tons, at 1s. per ton | | 688 |
| Total increased cost | | £4614 |

The cost, therefore, of increasing the illuminating power amounts to 1·25d. per 1000 cubic feet.

## Friday, March 24.

Mr. *Silverthorne*, in further examination this morning, said he had carefully considered the accounts of the Company, and had come to the conclusion, supposing that there was no alteration in the illuminating power of the gas, that 2s. 9d. per 1000 cubic feet would be a fair standard rate—providing, of course, that the present very high price for coal were eliminated. In the last year there had been a deficiency of £11,000, which could not be ignored; but, taking the state of things existing before, he thought 2s. 9d. would be a proper figure. His object in proposing a revision of the sliding scale was to induce careful management; and he believed that this would be the effect of it, and that no loss whatever would accrue to the Company because they would at once have a very strong inducement to exercise the necessary economy, which at present they would not do with a margin of 6d. between the actual figure charged and the initial price.

The CHAIRMAN: Have the Company made a profit at 2s. 9d.?

*Witness:* Yes; except the first year, they did make a profit. In the

second year they made a trifling loss; and last year they were deficient by about £12,000 upon their 11¼ per cent. dividend.

Cross-examined by Mr. SAUNDERS: At the present price of coal, it was impossible, at 2s. 9d. per 1000 cubic feet, to make the standard dividend. He was present during the whole of the discussion which took place before Mr. Forster's Committee, which resulted in the adoption of the sliding scale; and he saw perfectly what was intended. They merely meant to fix a standard which was then possible; in other words, they adopted what was considered to be the cheapest mode of producing gas, and fixed 3s. 9d. as the standard. As soon as the sliding scale came into operation, however, it was discovered that great economies were possible. Had the Brighton Company not set aside profits, the effect last year would have been to put up the price of gas. The principle of accumulating dividends was contrary to the obligations of the sliding scale. The legality of the practice had been tried in a Court of Law; and in the Ashton case it was held to be unlawful. The effect of it was to prevent the consumers getting the benefit of the sliding scale. It was the fact that the Brighton Company were one of the very few that did not raise the charge for gas when the cost of coal went up last year. The Company had reduced the price from 3s. 3d. to 2s. 9d. per 1000 cubic feet; thereby saving to the consumers about £24,000 a year. This had been the result of economy on the part of the Company.

Mr. SAUNDERS: Must it not always be to the interest of the Company to reduce the price as far as they can?

*Witness:* In order to get the benefit of the sliding-scale? Yes; it is, to that extent.

If you take away from the Company all the benefit they had as the effect of their economy, do you not take away the motive for economy in future?—No; I only restore the sliding scale to the intention of those who promoted it. The intention was not to accumulate profits at all.

I suggest to you that taking away from the Company the prospect of a higher dividend as a motive for economy, is doing away with the very advantage of the sliding scale?—I do not consider it would be right for the Company to go on accumulating such a liability for dividend as I find here. The great advantage to the consumer is to have the price reduced.

And that is concurrent with the increase of the dividend to the Company, is it not?—Not always.

The CHAIRMAN: I suppose it is possible, even with the sliding scale, for the Company to reduce their profits without raising the price?

Mr. SAUNDERS said this had not been the principle of Parliament. It had been to give companies an inducement to do it. Under the old system, there was none. They had a maximum 10 per cent. dividend; and he had no doubt they wasted a great deal of money.

Cross-examination continued: His experience in the management of gas-works was confined to France. The works were rather small; but they were entirely under his control. He visited them once a year. Being asked whether he would set his experience in France, at works which he visited only once a year, against Mr. Cash's experience of works he was carrying on every day, witness said he did not think it right to set up one person against another. He had, of course, had a great deal of experience of these matters by visiting gas-works, and investigating what was going on there for other professional purposes. He had never constructed gas-works. Witness was then examined at some length as to his statement that the illuminating power of the gas could be increased by 1½ candles at a cost of 1½d. per 1000 cubic feet, with the view of showing the fallacy of the calculations upon which it had been made.

Mr. *W. A. Valon*, examined by Mr. BAGGALLAY, said he had had considerable practical experience as a civil engineer in the construction and working of gas undertakings all over the country. It was necessary, when one wanted to compare prices and illuminating power at different places, to bring into consideration all the circumstances, or else it would be very misleading. He had inspected the works of the Brighton Company, as well as the district supplied by them. He found the works consisted of three sections—two fully in use, and one in process of erection. The two in use were, of course, filled with retorts; and the one now being constructed was partly filled. He had made an estimate of the amount of capital necessary for the future development of the works. It was £55,000; but as Mr. Cash put it at £60,000, he was willing to take the latter figure. To this must be added the construction of a new gasholder to contain from 2½ to 3 million cubic feet, to balance the new section. This would cost from £25,000 to £30,000; making the total outlay to complete the section and the gasholder, so that they might balance one with another, from £85,000 to £90,000. The sum of £200,000 would suffice for about 15 or 16 years. This was allowing for an increase of illuminating power to 15½ candles. The first Act of the Company was obtained in 1839; and granting that the same average rate of increase could be obtained in the future as in the past, and that £375,000 would be spent in the same proportion as the £590,000, the Company would not need to go to Parliament for about the next 36 years. He thought it unlikely that the same increase would be made in the forthcoming fifty years as during the past fifty; and, further, the sum of £590,000 original capital included premiums paid for the purchase of outside undertakings, foundations, and other expenses which could not occur again. Hence it was only reasonable to say that the £375,000 now asked for might be fairly taken as representing the works and mains capable of producing and distributing at least twice the output of 1891. With regard to the capacity of the third section of the works, he had taken the estimate of the Engineer, who told him that the new section would be calculated to produce a maximum quantity of 3 million cubic feet of gas per day, or 600 million cubic feet per annum—a quantity equal to about two-thirds of the present output. A make of 10,000 cubic feet per ton of coal would equal 60,000 tons of coal carbonized per annum; the present quantity being 84,000 tons. Supposing they had a lower yield per ton of coal, it would mean a higher yield per mouthpiece; the consequence being that the fuel, the wear and tear, and the labour were reduced.

The CHAIRMAN: You use more coal, and you get more gas per mouthpiece?

*Witness:* Yes, you can put in more coal. Mr. Cash says they have an average of 2½ cwt. In order to produce, in the same sized retort, 16-candle gas, you can get 10,000 cubic feet at that power; and in that case I should, as a practical man, increase the charge to 3½ cwt. So that I should absolutely get more gas made per mouthpiece, but less per ton of coal.

Examination continued: He was not prepared to say what the initial price should be for the future, having regard to the increased illuminating power, and so on. This would rather be a matter for argument. He thought, however, a great deal might be said in favour of reducing the standard, seeing that, notwithstanding the passage of all gas companies through critical times, both in the labour market and in respect of coal supply, during the last two or three years, the Brighton Company had been able to reduce the price of gas from 3s. 3d. to 2s. 9d., whereby the dividend had been increased from 10 to 11¼ per cent., and from 7 to 8¼ per cent., while at the same time a large reserve fund had been maintained, and the floating balance not used up. In no instance since 1881 had the sliding scale acted so as to bring the dividends below the statutory 10 and 7 per cent.; and therefore he thought much might be said in favour of the consumers who were of opinion that a sliding scale, in order to be equitable, should act both ways. He certainly considered that the illuminating power of the gas at Brighton ought to be increased, having regard to what was done at other places, and knowing the requirements of the town. It might well be raised to 15½ candles; and, in order to get this, it would be necessary to send out 16-candle gas.

Cross-examined by Mr. SAUNDERS: He was the responsible manager of the Ramsgate Gas-Works, which belonged to the Corporation. They were not subject to any sliding scale, and might charge the consumers what they pleased; but they did not do so. The price of gas was kept down to a moderately low point; and the town had half the resulting benefit. Whatever profit was made was divided between the consumers and the ratepayers; so that one-half went back in the shape of a rebate to consumers, the other half was placed to the district fund.

Mr. SAUNDERS: Then I do not think a ratepayer is much better off with you than where he gets three-fourths of the profit?

*Witness:* I am not responsible for that.

Cross-examination continued: In the case of Brighton, every reduction of price meant three-fourths of the profit to the consumer and one-fourth to the Company. At Ramsgate, the price of gas was 3s. per 1000 cubic feet with a rebate off. They supplied 16½-candle gas; and they could obtain 10,000 cubic feet from a ton of Durham coal without enrichment. But the gas was purified by means of pure oxygen and lime; and the consequence was that the illuminating power was not lowered—in fact, it was rather increased. In his estimate of £200,000, he had not put anything down for mains. There would be extensions in Brighton, and he hoped larger ones, there was not the slightest doubt; but £10,000 would go a long way in that direction. When at Brighton, he found that the high-pressure and low-pressure mains were of ample size—quite capable of taking the increased make of gas from the third section of the works. He thought Mr. Cash had overestimated the amount when he put it at £80,000 for a corresponding increase in respect of distributing appliances, as £2000 a year for the next fifteen or sixteen years was ample for mains in Brighton.

Mr. *Cash* was re-called, and examined with regard to a statement made by Mr. Silverthorne that he had calculated that the Brighton Company produced 5643 cubic feet of gas per mouthpiece. Witness said this was an impossibility at Portslade, as it would immediately cause the heats in the furnace to be so drawn upon that no amount of fuel would enable him to keep up the quantity of gas. The average produce of gas per mouthpiece was 4872 cubic feet. Had he crammed the retorts with coal, in the way suggested by Mr. Silverthorne, it would only have been partially exhausted; the result being that he would have lost the gas which was sent away in the coke, and a coke would have been produced which would have been almost unsaleable. When the entire third section of the works was finished, they would be capable of producing 6,720,000 cubic feet of gas per diem, or 1,344,000,000 cubic feet per annum. When this quantity was reached, they would require another section, which he would call the fourth section. That would be in the year 1901. This section would have to be started before it was wanted; and £74,000 would be required towards it. Last winter they drew to the extent of 40 per cent. on the third section. He had gone carefully into the actual money expenditure that would be required during the next twelve or fourteen years, and found it to amount to £81,000. He had not informed Mr. Valon that the Brighton Company had brought all the arterial mains into such a condition that they would not need renewal for fourteen years.

Mr. LITTLER then replied on behalf of the promoters. He said he was a little surprised, having regard to the very voluminous petition which had been presented against the Bill—a petition which looked almost like an indictment against the Company—that the opposition had not come to more than it had done. He was entitled to say that not a single complaint had been proved against the Company, either as to the illuminating power or the purity of their gas. The opposition was entirely based upon the report of Mr. Silverthorne. He did not wish to say anything disrespectful of anybody; but Mr. Silverthorne had been appreciated at his true value by his own evidence, when he said he had never managed a gas undertaking, but merely visited a gas-works in France once a year. Not a single consumer had come from Brighton to say that he had anything with which to find fault. It was true they had had an interesting, and somewhat microscopic, criticism as to how long it would be before the Company need apply to Parliament again for capital. It was idle to suggest that £200,000 would be sufficient. The Company had clearly proved their case for having powers to raise the £300,000 and £75,000 proposed. Inasmuch as the mischief fell upon the consumer rather than upon the Company if they had to come in ten instead of in fourteen years, the consumer had to pay in the end; and therefore he (Mr. Littler) would suggest the Committee should not give too small a sum. He quite recognized that, of late years, there had been a desire to increase the illuminating power of gas; but there was very considerable difficulty in knowing what was really the best thing to be done in this respect. In 1881, the Corporation of Brighton were content with 14-candle gas; and they made this power part of the arrangement which was then entered into. Why did they change their minds? No one had been called to explain that; but

two gentlemen had come before the Committee, and said that, because Parliament had specified 15 candles, therefore they must have 15 candles at Brighton, perfectly regardless of whether or not the town wanted it. If the illuminating power was raised, there must necessarily be a corresponding increase in price. The result of this would be to benefit the Corporation, who were furnishing electric light. If the Company had to supply 15-candle gas, the very lowest standard price the Committee ought to give should be 3s. 5d. After commenting upon the evidence, the learned Counsel reminded the Committee of the serious inconvenience which would be inflicted if the Bill were not allowed to pass.

The room was then cleared. On the re-admission of the parties,

The CHAIRMAN said: We think that, instead of £300,000 capital which the Company ask for, including stock issued and premiums, it should be £200,000; and this will involve a reduction in the borrowing power to £50,000. Then some question arose among the Committee with reference to the debenture stock being issued; but I think this was not claimed by the Corporation, and consequently we pass it by. We consider we ought to require 15 candles; but we leave the standard price as it is. This, I believe, decides really all the points upon which an agreement has not been arrived at, excepting the question about the use of the 20 acres of land if purchased. There was a clause to be settled as to within what distance the Company should be allowed to put a holder. The right to use the 5 acres of land for making gas was not opposed. Then there was the supply of the additional district. The Committee intimated, in the course of the arguments, that they would grant the extension of limits. As to the question of the sale of gas in bulk, there was no objection to that.

Mr. SAUNDERS said this matter was conceded.

The CHAIRMAN: With reference to the clause about the power to supply gas fittings, engines, and other apparatus, I believe that was agreed upon—striking out the word "manufacture."

Mr. SAUNDERS: Yes.

The CHAIRMAN: So that the only clause we have to settle is with regard to the use of the 20 acres of land. The Committee are inclined to think that Hove ought to be protected the same as Brighton.

Mr. CRIPPS said half a mile was suggested.

The CHAIRMAN: Very well.

The clauses of the Bill were then read and agreed to; and the Chairman was directed to report the Bill, as amended, to the House.

# LEGAL INTELLIGENCE.

## SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

**Wednesday, April 12.**

(*Before the* MASTER OF THE ROLLS *and Lords Justices* LOPES *and* A. L. SMITH.)

### Henderson v. Newcastle and Gateshead Gas Company.

This matter came before the Court on an application by the plaintiff that judgment might be entered for him, or that a new trial might be had, on the ground of improper rejection of evidence and misdirection by the learned Judge (Mr. Justice Henn Collins) who originally tried the case (see *ante*, p. 421), and that the verdict was against the weight of evidence.

Mr. STRACHAN, who represented the appellant, said the action was brought against the Newcastle and Gateshead Gas Company by the owner of a house at Blaydon, for damages in respect of its total destruction as the result of an explosion of gas, which was alleged to have taken place by reason of the negligence of the Company's servants. The facts of the case were that the house, which was a new one, was built in two flats—each having a separate entrance. The tenant of the upper flat, desiring to have a supply of gas, applied to the Company for the purpose; and accordingly, on Nov. 24, 1891, their servants came to make the connection. This they did by joining the lead service-pipe, which was put in when the house was built, to the main, by means of an iron pipe, in which they put a stopcock. Soon after the gas was turned into the pipe, an explosion took place which completely wrecked the house. The defect that caused the explosion was in the lead pipe laid down at the time the house was built. The contention on behalf of the plaintiff was that, although he had put in that pipe, it was the statutory duty of the Gas Company to do it; and they had, by their action, adopted the pipe as their own. The gas was the property of the Company until it reached the outlet of the meter; and they were bound to see that there was no escape until the gas arrived at the meter. One of the allegations of negligence was that the defendants' men had caused the fracture in the pipe in making the connection in the street; and another was that they were careless about turning on the gas—they ought, in fact, to have waited a reasonable time to ascertain whether or not the pipe they had adopted and used was reasonably fit for the purpose it was to serve. If the Company had themselves laid the pipe, it would undoubtedly have been their duty to see that there was no defect in it up to the meter. The only question the learned Judge who tried the case would leave to the jury, and on which he would allow the appellants to give evidence, was whether or not the Company's men had caused the fracture. The jury agreed that they had not. The Judge therefore held that there was no obligation on the Company's servants to do more than simply turn the gas into the pipe they found.

Lord Justice LOPES remarked that the service-pipe was laid by the plaintiff, and it was defective.

Mr. STRACHAN said it was defective at the time the gas was turned into it.

Lord Justice LOPES asked if the cause of the mischief was not the defect in the pipe laid by the plaintiff.

Mr. STRACHAN replied that it was; but he urged that it was the duty of the Company, before adopting the pipe, to have inspected it by turning their gas into it.

Lord Justice LOPES inquired if the Company were not entitled to assume that, if the plaintiff had laid the pipe, it was done in a proper manner.

Mr. STRACHAN said no. It had already been decided that, even when a gas company laid the pipe themselves, they were not entitled, after turning on the gas, to go away assuming that it was all right; and *a fortiori* it would be their duty to ascertain whether or not the gas would escape when they sent it into pipes laid by somebody else.

Lord Justice SMITH asked, supposing the pipe to be covered over by boards, if the Company's men ought to have removed the boards to inspect it.

Mr. STRACHAN replied that they had the power to do so.

Lord Justice LOPES: It really comes to this, negligence by the defendants in not examining the pipe that was laid by the plaintiff before they turned the gas into it.

Mr. STRACHAN said that was one point. Section 11 of the Gas-Works Clauses Act, 1871, imposed on the supplying gas company the duty of providing and laying all pipes that were necessary for furnishing gas to a consumer's premises.

The MASTER of the ROLLS remarked that, if a man laid the pipe himself, it was not necessary for the gas company to do it.

Mr. STRACHAN said the Company adopted and used the pipe, by turning their gas into it for the purpose of reaching the meter. It was their gas all the time.

The MASTER of the ROLLS asked why the owner of the house put in the pipe.

Mr. STRACHAN replied that he did it so that the Company might use it if they wished to do so. The Company supplied the gas up to the meter; and it was theirs till they measured it out at the meter.

The MASTER of the ROLLS said there was nothing in the Act about "measuring it out." The Company's obligation was to supply the gas to the premises.

Mr. J. LAWSON WALTON, Q.C., M.P., and Mr. F. J. GREENWELL, who appeared for the Company, were not called upon.

The MASTER of the ROLLS, in giving judgment, said the defendants were asked to supply the house of the plaintiff with gas; and, in order to do this, they were bound to provide all pipes that were necessary for the purpose of making the connection. It appeared that there was a lead service-pipe already provided by the owner; and all that it was necessary for the Gas Company to do was to connect this pipe with their main. This they did by furnishing a perfectly good pipe, and fixing it at one end to the pipe already in position, and at the other end to their main. Therefore, all the work which the Company had to do for the purpose of furnishing a supply of gas was properly done. It was alleged that they did this work improperly, by causing a fracture in the lead pipe. But this question was left to the jury, who found in favour of the Company. Their next obligation was to send the gas into the pipe so connected. This they did; and there was not a tittle of evidence to show that it was done improperly. Then it was alleged that, having furnished the pipe they had to provide, having connected it in a manner which could not be found fault with, and having let the gas into that pipe, they ought to have waited to see if the gas escaped—not at the connection which they themselves had made, but from the pipe the owner of the house had supplied—to see, in fact, whether that pipe was good or bad. The learned Judge who tried the case said there was no such duty imposed upon the Company; and he (the Master of the Rolls) entirely agreed with him. The Company were not liable for the unfortunate accident which happened; and, after the finding of the jury upon the only material fact in dispute, the Judge was quite right in directing them as he did. The appeal must therefore fail.

Lords Justices LOPES and SMITH gave judgments to the same effect.

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**Sales of Shares.**—At the Commercial Hotel, Westhoughton, last Wednesday, Mr. J. Rothwell offered for sale 75 shares in the *Westhoughton Gas Company*. The larger portion comprised 50 "A" shares, fully paid up (£10), which were disposed of at the following prices: 15 at £11 5s. each, 10 at £11 7s. 6d. each, and 25 at £11 5s. each. Ten "B" shares, of £10 each, fully paid, were next offered; five fetching £10 17s. 6d. each, and the others £11 2s. 6d. apiece. Some "B" shares (£7 paid up) realized £7 15s. per share.——Ten £10 shares in the *St. Neots Gas Company, Limited*, were disposed of recently, at a local sale, for £19 each.——At a recent sale at the Auction Mart, E.C., Messrs. Fox and Bousfield found purchasers for the following stocks and shares: *South Metropolitan Gas Company's* "B" stock, at 240 per cent.; *Tottenham and Edmonton Gas Company's* "A" stock, at 229 to 230 per cent.; do. "B" stock, at 170 per cent.; *Barnet District Gas and Water Company's* "A" stock, at 190 per cent.; do. "C" stock, at 190 per cent.; do. "D" £10 shares, at £14 each.

**The Transfer of the Rhyl Water-Works to the Improvement Commissioners.**—A special meeting of the Rhyl Improvement Commissioners was held last Saturday week to conclude the transfer of the water-works from the Company to the Commissioners. Mr. Baker, the Solicitor who has been acting for the latter body in the matter, said the transfer was ready for completion. If the £70,000 which it was agreed to pay for the works were handed over that morning, the whole concern would be passed to the Commissioners. He might mention that the debenture bonds of the Company amounted to £12,500. The representatives of the Bank of England would be present when the Commissioners met the Directors of the Water Company later on in the day, when two cheques would be drawn by the Commissioners—one for £70,000 for the purchase, and another for £2000 to the order of the Commissioners. Out of the second cheque, the Commissioners would draw a cheque for £1000, which would be handed over by way of deposit to the Solicitor to the Water Company. It was agreed that the cheques be signed as stated by Mr. Baker. The Commissioners then met the Directors of the Company; and the cheques were signed and handed over, while the deeds and documents of the Company were transferred to the Commissioners' Solicitor. The Chairman of the Commissioners (Mr. W. E. Williams) congratulated the members upon the acquisition of the works, and thanked the Directors for the manner in which they had dealt with the Board during the negotiations.

# MISCELLANEOUS NEWS.

## METROPOLIS GAS SUPPLY.

### The Quality of the Gas in the Past Quarter.

The following is an abstract of the report of the Chief Gas Examiner for the Metropolis (Dr. A. W. Williamson, F.R.S.) as to the quality of the gas supplied by The Gaslight and Coke, the Commercial, and the South Metropolitan Companies, during the quarter ending the 31st ult. :—

I. *With respect to Illuminating Power.*—The average illuminating power, in standard sperm candles, at each of the testing-stations, was as follows :—

| | |
|---|---|
| The Gaslight and Coke Company— | |
| Fenchurch Street, E.C. | 16·4 |
| Kinghorn Street, E.C. | 16·4 |
| Dorset Buildings, E.C. | 16·5 |
| Ladbroke Grove, W. | 16·3 |
| Devon's Road, E. | 16·3 |
| Carlyle Square, Chelsea, S.W. | 16·2 |
| Camden Street, N.W. | 16·4 |
| George Street, N.W. | 16·2 |
| Graham Road, E. | 16·6 |
| Kingsland Road, E. | 16·4 |
| Spring Gardens, S.W. | 16·2 |
| Grove Gardens, St. John's Wood, N.W. | 16·1 |
| Hornsey Road, N. | 16·3 |
| Lambeth Road, S.E. | 16·1 |
| Millbank Street, S.W. | 16·6 |
| Commercial Gas Company— | |
| Parnell Road, E. | 16·3 |
| Wellclose Square, E. | 16·5 |
| South Metropolitan Gas Company— | |
| Hill Street, S.E. | 16·4 |
| Bedford Road, S.W. | 16·4 |
| Stoney Lane, S.E. | 16·2 |
| Lewisham Road, S.E. | 16·4 |
| Blackfriars Road, S.E. | 16·3 |
| Burrage Road, S.E. | 16·2 |

It will be seen from these results that the average illuminating power at all the testing-stations was higher than the parliamentary standard of 16 candles.

II. *As regards Purity.*—Sulphuretted hydrogen was not present in the gas at any of the testing-stations. The average amount of sulphur in other forms than this was considerably less than the limit allowed—viz., 22 grains—at all the testing-places. At some, the average amounted to less than one-half of the quantity permitted. With the exception of two occasions, the maximum amount of sulphur present in the gas was within the limit at all the stations. Ammonia was generally present in the gas more or less frequently throughout the quarter at all the stations, but only in slight quantities. The limit allowed was not exceeded on any occasion.

## COMMERCIAL GAS COMPANY.

The Ordinary General Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. J. Blacket Gill in the chair.

The Secretary (Mr. H. D. Ellis) read the notice calling the meeting; and the report and statement of accounts, which appeared in the last number of Journal, were taken as read.

The Chairman then proposed—"That the report and accounts be received and adopted, and entered on the minutes." The Directors were, he said, pleased to meet the proprietors at the end of another six months, and to give an account of their stewardship. The reason their meeting was a week later than usual was, as probably they would be aware, that Easter intervened. The number of the proprietors had now increased to about 1300; and a considerable amount of work had to be done in getting the dividend warrants ready. It had therefore been necessary to postpone the meeting for a week; but he trusted this had not caused any inconvenience. He thought that generally they might congratulate themselves upon the statement now submitted; for certainly, for the first time since June, 1890, the accounts showed a substantial improvement in working results. At the same time, they had had the good fortune this year of having very nearly earned their dividend. Coal had cost less by about £10,000, in comparison with the sum paid in the December half of 1891, and labour was about £900 less; but he was sorry to say a great deal of this advantage had been taken away through the loss on residuals, amounting to £6700. Stove and meter rental had increased by £151; and they had received for gas £13,700 more, which, of course, was accounted for by the higher price charged. Their stoves now stood at 4011; being an increase of about 267 upon the whole year, but not much advance was shown upon the past half year. They were enabled to take to profit and loss account £44,441, which was equal to 12½ per cent.; but they thought, under the circumstances, that the proprietors would approve of the withdrawal of £710 from their invested reserves, so as to make up their dividend to 12½ per cent. It had not been their policy lately to pay the full amount; their statutory dividend being 13 per cent. Some persons said that the Company did not get much credit for this; but at least they themselves had the satisfaction of feeling that they were dealing in a generous manner with their consumers, because it would be seen that, if they had always paid their full statutory dividend, they would have had to raise the price sooner than they did, as they must have made increased demands on their reserve fund. During the past six months, trade had not been very good. But, taking the year 1890, they found an increase of 2·67 per cent. over 1889 in the quantity of gas sold; in 1891, they had an increase of 6·1 per cent. over 1890; while in 1892, they had an increase of 5·4 per cent. over 1891. The past half year, however, did not show an increase; but rather the reverse. Whenever trade was bad, they generally felt it more, perhaps, at the East-end of London than it was felt in any other part. Some of their best consumers had been the publicans. Possibly the friends of the temperance movement would be glad to hear that the publicans had not been doing a "roaring trade" of late; and the Company found that their returns from this section of the consumers had been less. As he had said, this might be gratifying to the people he had referred to; but it was not so agreeable to gas proprietors. Then the weather had an extraordinary effect upon the consumption of gas. Last winter was not so cold or so severe as the previous one; and there was another thing which he thought they might justly complain of—that the East-end was free from fog. (Laughter.) He often found in the West-end that they were being almost choked with fog; but when he got down to Stepney, he found sunshine. Perhaps the West-end people would some day come and take up their residences in this neighbourhood; if so, it would be so much the better for the Company. With regard to the question of price, they found it necessary to make an advance; and this had caused a certain amount of feeling and agitation in the district, He was rather startled one morning, when walking down to the office, to find a large placard put up, in terms more forcible than elegant, stating that the Company had been guilty of a most iniquitous proceeding in raising the price of gas when they were paying a good dividend. He thought that the agitation was somewhat unreasonable, on two or three grounds. In the first place, they really supplied gas cheaper than either of their neighbours. The big Company who bounded them on both sides charged 4d. per 1000 cubic feet more; while the price of the West Ham Company was 5d. more. He therefore did not know why their Company should have been singled out for so much agitation; but he was afraid that consumers did not take the trouble to wade through accounts, or to consider matters fully. They jumped to the fact that, if the Company were paying a large dividend, they ought not to raise the price; but the Commercial Company had for some time supplied gas cheaper than either of the other Metropolitan Companies. Several circumstances had also been strongly against them. The Durham strike, for instance, cost them not less than £10,000 in money, and considerably more in working results. Then they had a large rise in the expenditure for labour some time ago. This gave them much anxiety; and they conceded to their stokers the eight-hour system, which meant a large addition to their expenses. This cost the Company about 2d. per 1000 feet. Then there was a tremendous fall in the price of residuals; and they lost in one half year, in comparison with the previous six months, £25,000. They had therefore really earned only practically 6 or 7 per cent.; and they had made up their dividends by taking the money from the reserve of undivided profits. It was not until they had taken £65,000 of these profits, and a sum of £5000 from the invested reserve, that they found it absolutely essential, in the interests of the Company, to put a modest increase on the price of the gas. Another fact was lost sight of by the gentlemen who spoke at agitation meetings—viz., that gas proprietors really obtained very little more than 6 per cent. They had bought their stock at a very high premium, with, of course, the chances of the market; but it would inflict a great hardship on many of the smaller proprietors if they reduced the dividend to a very low limit. Moreover, in 1875, Parliament gave them the sliding scale; and thus established a partnership between the consumers and the shareholders. Hitherto this had worked very well; and it was greatly to the advantage of the Company to keep their price as low as they could. The Directors knew that the Company had many enemies to contend with in the shape of oil, the electric light, &c.; and the proprietors might trust them to endeavour to be on the very best terms with the consumers. He might mention that they had now made a fresh contract for coals at a very considerably reduced price; but this would not come into operation until the autumn. When it did, he had no doubt—in fact, he was quite sure—that they would seek the earliest opportunity of making a reduction in the price now charged; and they hoped to effect this before many months were over. He desired, in this world of uncertainty, when it was the unexpected that generally happened, not to give any pledge; but it was their hope that a reduction would be made before the end of the year. The works were all maintained in good order; and they had recently satisfactorily accomplished an engineering work of some difficulty, by putting a new main under the London Docks, joining the Wapping with the Poplar works. They had offered to the proprietors by tender £3821 of debenture stock, which had been allotted to them at an average price of 125¾. He hoped they might look to the future with some degree of confidence and hope. With cheap coal, they ought to have better results certainly next half year; and they were endeavouring, as far as they could, to get at the working people by establishing what were called "coin meters." The system had been established by the South Metropolitan Company; and a number of the meters were at work in that district, and were bringing in good results. They were very desirous of stimulating trade in this direction; and he hoped that, before they met again, these meters would be in use in their district.

The Deputy-Chairman (Mr. Robert Jones) seconded the motion, which was unanimously adopted.

The Chairman afterwards proposed the payment of dividends at the rates per annum of 12½ per cent. on the old stock, and of 9½ per cent. on the new stock.

The Deputy-Chairman seconded the proposition, which was adopted.

On the motion of Mr. W. G. Bradshaw, seconded by Mr. Coleman, the retiring Directors (Messrs. Gill, Jones, and Farnan) were re-elected; and the retiring Auditor (Mr. Haigh) was also re-appointed.

Mr. R. Hesketh Jones, J.P., then proposed, and Mr. Coleman seconded, a vote of thanks to the Chairman and Directors, which was carried unanimously.

The Chairman briefly acknowledged the compliment, and then proposed a vote of thanks to the Chief Engineer (Mr. H. E. Jones), the Secretary, and the staff, whose services he warmly recognized.

The motion was seconded, and unanimously adopted.

Mr. Jones, in reply, observed that it was a singular circumstance that gas companies were not in the habit of rejoicing when trade was very good; but the reason of this was that in that case the price of their raw materials—coal and iron—rose. On the other hand, gas

companies were benefited when trade was bad, because these materials became very much cheaper. Let them imagine the position of things which occurred when two years ago their coals were put on board ship at Newcastle at a price 100 per cent. more than they had been paying. It was true that residuals followed this advance; but not to the same extent, and they also fell before coal. This had prevented the Company from reducing their price; but they now hoped soon to be able to do so.

The SECRETARY also returned thanks; and the proceedings then terminated,

## THE PUBLIC LIGHTING OF THE CITY OF LONDON.

The Engineer and Surveyor to the Commissioners of Sewers of the City of London (Mr. W. Haywood, M.Inst.C.E.) has presented his report on the work of the past year. With regard to the lighting of the public thoroughfares, he states that tenders were received from The Gaslight and Coke Company for lighting the gas-lamps from Jan. 1, 1892, on the following terms for 4300 hours per annum, including gas (at 2s. 2d. per 1000 cubic feet), lighting, and repairing: Square lanterns, with jets burning 5 cubic feet of gas per hour, £3 4s. 7d.; round do., £3 8s. 10d.; square lanterns, using 10 cubic feet per hour, £5 11s. 2d.; round do., £5 15s. 5d. The number of specially noticeable defective gas-lights observed during the year was 191. The 36 meters attached to the public lamps in various parts of the City showed that the full contract quantity of gas was furnished to those lamps. Acting on general instructions which have been in force for many years, the Company lighted the public lamps throughout the year whenever fog or unusual darkness ensued. This occurred on 14 occasions. The experimental lighting of certain streets by gas, at the sole expense of the Company, was continued until those thoroughfares were lighted with arc lamps. As to electric lighting, Mr. Haywood reports that on Jan. 1 of the present year there were 409 lamps in operation; comprising 194 in the east, 119 in the central, and 96 in the west district. The length of main thoroughfares lighted on that date was as follows: East district, 5¼ miles; central district, 2¾ miles; west district, 3 miles—total, 11 miles. At the end of last year, there were mains and conduits in 22½ miles of street; the total length of the trenches opened up to then within the City being about 52⅜ miles. The gas lighting in the main thoroughfares was discontinued from time to time as the electric lamps were put into operation. The gas lamps and fittings, however, were not removed; arrangements having been made with the Gas Company for cleaning and maintaining the lamps ready for lighting to meet the contingency of failure in the electric light. The number of gas-lamps unlit at the end of the year was 1126; the number of arc lamps lighted being 409. Consequently, 2·75 gas-lamps were extinguished for each arc lamp. The number of public ways remaining in which the Electric Lighting Company have not laid conductors is 621; but the largest portion of these are small streets and courts and alleys and narrow thoroughfares. The Company having been required by Mr. Haywood to place experimentally glow lamps within the gas-lamps in such manner as to leave the gas available for the contingency of failure, the Gas Company objected to this being done, and expressed their intention of removing the gas-fittings when the glow lamps were placed inside the lanterns. The question arose as to the propriety of lighting the minor streets by incandescent lamps, and as to the relative cost of gas and electricity for that purpose. The matter was referred to the Engineer, who reported thereon to the Streets Committee of the Commission at the beginning of the year; and at the date of the report under notice (March 21) it was still under their consideration.

## THE PRICE OF GAS AT MIDDLESBROUGH.

At the Monthly Meeting of the Middlesbrough County Council last Tuesday—the MAYOR (Mr. C. Lowthian Bell) presiding—a resolution was submitted by Alderman Hugh Bell, Chairman of the Gas Committee, that the net price of gas be increased from 2s. to 2s. 3d. per 1000 cubic feet. A letter was read from a meeting of ratepayers and consumers, protesting against the proposal.

Alderman BELL, in the course of his remarks in support of his proposition, said he was quite content to take the resolution which was passed at the meeting of ratepayers as the text on which he would urge the Council to vote in favour of his motion. The resolution began by saying that already the gas-works were paying exceptionally well; but the reason that he asked the Council to raise the price of gas was that the gas-works were not a sufficiently paying undertaking—they did not return a proper income for the expenditure that had been incurred. There had been placed before them a paper showing what the actual returns of the gas-works had been, for a period of nearly 36 years, since they came into their possession; and it showed that the average gross profit during that time had been no more than 8·8 per cent. This was gross profit, before any charge was put against it for interest and redemption; and he maintained that, even if he could make out no better case, he would still be entitled to ask them to increase the price of gas. At the present time the gas-works were a very hazardous commercial enterprise of the ordinary kind. The production of gas had undergone great changes; it was meeting with very serious competition; and they might easily find themselves within a few years constrained to consider whether they ought not, in justice to the ratepayers, to abandon the gas-works and substitute another method. To tell him that a profit of eleven years' purchase was sufficient for such an undertaking, was to tell him that which no commercial man would entertain for a moment. They had hitherto cherished a hope that, if they were compelled to put down an electric plant for lighting purposes, they would still have a demand for gas for heating and cooking; but now both heating and cooking were being done by electricity; and it was by no means improbable that, long before the eleven years' purchase had expired, they would find that both cooking and heating and lighting would be done generally by electricity. Looking at the past few years, and disregarding the average of the 36 years, his case was infinitely stronger. For the last year or two, the profits had been barely 4 per cent.; and for the last five years, they had only been about 7 per cent. That was an inadequate profit; and, regard being had to the fact that they were at present contemplating a further investment of capital in an enterprise which might possibly not prove as enduring as it had in the past, they would be unwise to go into that, unless they were prepared to charge a larger sum for what they were producing. When the gas-works were acquired, the charge was 5s. 10d., so that it could not be said that the works had not been kept up to the times in management; and he could challenge anybody to say that a charge of 2s. 3d. was an unreasonable one. For his own part he regretted that he was not proposing to increase the price by 6d. As a matter of fact, he was only asking them to pay what they had recently been losing in the reduction of the price of the residual products and the increase of wages. It was perfectly true that his firm had adopted the electric light; but they burned every cubic foot of gas in an engine that they would if they were using it for lighting purposes.

Alderman BULMER seconded the motion, and said, when they had spent the additional capital, the profits on the undertaking would be £8396 short of paying 7½ per cent.; whereas no private company would be content unless they were getting 10 per cent.

Alderman JONES, in opposing the motion, said there did not seem to be any hurry for incurring additional expenditure at the gas-works, if, as Alderman Bell stated, the electric light was to supersede gas.

Alderman ARCHIBALD observed that, if the alteration was made, it would put upon the gas consumer, as against the ordinary ratepayer, a gross inequality; for the gas consumer would have 10½d. in the pound added to his rates, as against a reduction of 4d.

Mr. BURROWS said that in his own case the increase in his gas bill would amount to £7 6s., if the proposed extra charge were made, while the reduction in the rates, so far as he was concerned, would only be £2 17s. 4½d.; so that he would be paying the difference for the benefit of those who did not use gas.

Alderman HINTON said up to then he had favoured the proposed increase; but he had found that there were three classes of ratepayers who would pay considerably more for their gas, and would not reap a corresponding benefit by the reduction of the rates. The ironmasters would have to pay 3d. per 1000 cubic feet more, and would only receive ¾d. in the reduced rate. As to shopkeepers, he found that in one case, whereas the increase in the gas bill would be £4 2s., the reduction in the rates would be only 13s. 4d. They would also inflict a heavy fine on the places of worship. If the increase were made, there would be a very large sum of money go to ratepayers who did not use gas, which he thought would be palpably unjust.

Alderman J. F. WILSON said he intended to vote in favour of the increase, because he thought it would bring about a more equitable adjustment between the price of gas and the rates of the town. He regarded the Corporation and the town generally as shareholders in the gas-works, and the gas consumer as a customer; and he considered that they were entitled to a profit of 5 per cent., because it should be borne in mind that any falling off in the value of the undertaking would not come on the consumers, but on the ratepayers generally.

On a vote being taken, the motion was lost by 25 votes to 9.

**Suffocated by an Escape of Gas.**—An inquest was held last Friday, by Mr. S. Smelt, the Deputy-Coroner for Manchester, on the body of Elizabeth Royle, aged 76, a widow, residing at Oakworth Street, Blackley. She went to bed early on Wednesday evening; and when her daughter visited her shortly before eleven o'clock, she found her dead. A small jet of gas had been left burning when Mrs. Royle retired; but this had gone out. A plumber who was called in discovered there was an escape of gas from the meter (which was in the room where the death took place) sufficient to light two jets. The gas was coming from a hole between the glass in front of the index and the frame above it; and expert evidence showed that the escape was due to a fault inside the meter. An examination of the body showed death to be due to valvular disease of the heart, aggravated by the inhalation of gas. It was stated by one witness that there were 80,000 meters in use in Manchester; and that the average escapes of this kind was only one a year. A verdict of "Death from natural causes, accelerated by an accidental escape of gas," was returned.

**Exhibitions of Gas Appliances.**—During the past week, Messrs. Fletcher, Russell, and Co., Limited, had an excellent exhibition of their cooking and heating stoves and general gas appliances in the Northumberland Hall, Newcastle. Their new cooker, the special feature of which is the moveable enamelled lining, which facilitates cleaning, was a prominent feature of the display. Cookery lectures were delivered twice each day by Miss H. M. Young. The same firm also held an exhibition in the Lesser Park Hall, at Cardiff. The duties of lecturess were ably discharged by Mrs. Edden. A collection of their goods was shown during the week at Liskeard, where the Company have resolved to reduce the price of gas for cooking and heating purposes from 4s. 7d. to 3s. 6d. per 1000 cubic feet. The exhibition and lectures (delivered by Miss A. L. Rotherham) were well patronized. ——At St. Nathanael's School, Bristol, an excellent assortment of stoves and labour-saving appliances for the kitchen, sent by the Davis Gas-Stove Company, Limited, has been shown during the past few days. The advantages of cooking by gas were well demonstrated by Miss A. Johnson.——A series of cookery lectures were given last week in the Corn Exchange, Newark, by Miss Smith, and considerable interest was manifested in them. Arranged round the room were specimens of the most modern gas cooking and heating apparatus, brought together by the Gas Company.——A very successful exhibition was held from Monday to Friday last week in the Central Hall, Walsall, by Messrs. W. Parkinson and Co. In addition to the gas cooking and heating stoves shown, there was a good display of modern gas burners, fittings, &c.; and Messrs. Tangye had in action a 3-horse power gas-engine. Miss Sanderson gave cookery lectures twice each day; and these, as well as the exhibition, attracted a large number of visitors.

## SOME NOTES FROM AMERICA.

**By Our Own Correspondent.**

Niagara Falls has always been one of the wonders of the world—the "Mecca" for those seeking to see Nature in all the greatness of her power and strength. There they stand, awestruck by the vastness of its power, and entranced by the beauty of the immense body of falling water. But many people have not merely beheld and marvelled, but they have been struck by the enormous waste of power thus daily going on, and have mentally measured—doubtless inadequately—the amount of mechanical energy represented by the falling waters. Probably many and many a man thus reflecting on the waste of energy, has turned away with the thought that he would make his fortune by harnessing Nature in all her grandeur, and making her do his bidding. But calculations as to the cost of the process of harnessing have turned many a one back; and so we have heard from time to time that Niagara was to furnish the power for half the globe, and soon the scheme would be forgotten. Now, however, it would seem that the time is not far off when we shall see a portion of the strength of this mighty water turned to do for man good and useful service; for it is announced that the Cataract Construction Company will have their works completed by the first of next July. It is fair to assume, however, that this ante-dates the actual starting of the power. The enterprise has been under way for nearly two years; and much money and many lives have been spent in its execution. We note that two of the water-wheels are now being built in Philadelphia, each of 5000-horse power; and it is said they will cost in the vicinity of $100,000. The designs for them are by Messrs. Faesh and Piccard, of Geneva. Each wheel is of two superimposed turbines; and the water is fed between the wheels in conduit pipes, with the discharge on the exterior. The main canal is 1500 feet long; 200 feet wide, tapering down to 125 feet: with a depth of from 11 to 15 feet. The many raceways coming off this canal will provide for a power of 146,000-horse power; and as the bulk of the power will be used at that point, and figuring that each horse power will bring three inhabitants to the place, it is argued that the little village of Niagara will later become a city of 400,000 inhabitants. Possibly, we may be excused for saying that this is discounting the future very largely, particularly as the scheme is to turn the energy developed by the wheels into electric power, and convey this to cities far and near. It has frequently been stated that the electric current thus generated would be conveyed to Buffalo; but all this is in the future, for there are many difficulties yet to be met and overcome before the needful dynamos revolve. It is sometimes difficult to build up a city according to programme; for in addition to power, help is an important requisite, and sometimes we find people move with difficulty. Then again what price will the Company be compelled to ask per horse power, in order to obtain a fair interest on its vast investment? This is an important consideration. It is worthy of note, however, that the Company expect to develop and transmit to Buffalo 10,000-horse power, electrically, and promise to compete in price with power now developed in the city, even in large units.

Another scheme, of like nature but of smaller proportions, is being carried out at Sacramento, Cal., where a Company owning water power situated about 20 miles from the city are arranging to convey the power to the city, electrically, and there use it for light, heat, and power. It is stated that the projectors of the enterprise anticipate transmitting the energy 20 miles with a loss of 25 per cent. It is, however, fair to assume that the interest on the investment will cut a large figure per horse power; but as coal is high there, the venture may turn out a perfectly safe one.

Many of the duties of the employees of electric companies are indeed onerous and dangerous. Imagine the experience of the trimmers during the recent winter—one of the severest we have had for many years—mounting daily to the top of the tower lights used so much in our western cities. We have before us an account of the dangers experienced by the trimmers of this class of light in Grand Rapids, Michigan, where the city has 40 tower lights. In ordinary weather, the trimmer ascends in a kind of cage; but when there is a heavy blow, the cage rocks too much to make this plan safe. He is forced therefore to go up the ladder fixed on to the tower. Remembering that the towers are 150 feet high, and that the weather we have been experiencing this winter has not been of the best, it will be generally conceded that the task is one not to be sought for.

In a previous article, in speaking of the consolidation of electric light and gas companies in several cities, we remarked that consolidation was a good thing if after the combination was effected someone did not come in to compete. Rochester (New York State) comes up as a case in point. There, a "combine" had been effected by bringing under one management the three gas and three electric light companies of the city—the title of the combined companies being the Consolidated Electric Light and Gas Company. Now a new concern, trading under the name of the Citizens' Light and Power Company, has asked for and obtained a franchise. The reason given for granting it is that the Consolidated Company have a monopoly of the business. It seems passing strange that under such circumstances the city government should not address itself to the task of righting any evils which may have arisen by the methods pursued by the old Company, rather than permit the streets to be again dug up, and the avenues encumbered with additional wires. It seems all the more strange when we recall that there is nothing to prevent the new Company from combining with the old one when both parties get good and ready.

Lighting matters have been quite lively of late at Detroit, Michigan; and it may be added things have not yet assumed a very calm aspect. First, the city has been very much exercised about making a new contract for street lighting by electricity; and in this connection it is worthy of note that Detroit is one of the western cities having a large number of tower lights. Hitherto they have used 113 of these hugh structures; and now they purpose adding 37 more—making the number 150. These towers have come in for a good deal of attention while this discussion has been on the board; for the reason that the city called for tenders to light the city by the use of these towers, and it so happens that the two electric companies already established controlled the patents on these structures. This has made it very hard for a new company which is desiring to obtain a foothold in the city. For the present the difficulty has been bridged over by reference to the new Council. The second cause for excitement in lighting matters at Detroit, is the price of gas. Those who are familiar with the history of gas lighting during the last twenty-five years will readily understand me when I say that the City of Detroit is a name which has become well known to all, on account of matters relating to this industry; for it was at this city that one of the earliest and most hard-fought battles took place on the question of competition or no competition in the supply of gas. Competition then won the day; and the Mutual Gas Company of Detroit came upon the scene to fight the old established Detroit Gaslight Company. However, competition in such matters cannot always last; and, after a spell, there was a division of territory, and an agreement on prices. Of late, there has been an even closer working arrangement between the two concerns; but it now turns out that there was a peculiar clause in the Charter of the Mutual Company, to the effect that the Company should not charge more for its gas than the average price in certain cities. The clause is worthy of reproduction—

> While there exists competition in the supply and sale of gas light in the said City of Detroit, the said Corporation shall have the privilege of supplying it at such rates less than charged by the Detroit Gaslight Company as may be agreed upon between it and consumers, public and private. Said Corporation shall in no instance, nor under any circumstances whatever, charge either public or private consumers higher rates for the supply of light than an average of the rates charged such public and private consumers and paid in the cities of Buffalo, Chicago, Cleveland, Toledo, and Sandusky.

This interesting document coming to the attention of the Mayor, he recently wrote the Mayors of the several cities mentioned and obtained from them an official statement of the prices charged for gas in the municipalities, from which he constructed the following table:—

| Name of City. | Price of Gas. |
|---|---|
| Cleveland | $0·80 |
| Chicago | 1.20 |
| Buffalo | 1·20 |
| Sandusky | 1·00 |
| Toledo | 1·10 |
| Average price | 1·06 |
| Price charged in Detroit | 1·50 net. |

Armed with this information, in the form of a letter to the Gas Company, the Mayor repaired to that Corporation's office and tendered $3 29 c., the amount of his gas bill for the month, figured at $1·6 c., which, of course, the Company refused to accept in settlement of the account. Now, the Mayor is hoping the Gas Company will cut off his supply of gas, in order that he may get the matter before the Courts. All of this goes to show that many gas charters are loosely drawn, and thoughtlessly granted; and of all stupid clauses to insert in a franchise, few are much more unpardonable than the one fixing the price arbitrarily on the basis of the figures obtaining in other cities.

Montreal has succeeded of late in getting up quite an excitement on lighting matters. It would seem that the contract of the Royal Electric Light Company has about a year to run; but as there was some agitation in the matter of price throughout the city, the Company evidently feared trouble a year hence. It is also fair to assume that they contemplated making some large extensions to their plant, which they were naturally disinclined to do, not knowing whether their contract would be renewed at the end of the year. They therefore thought to take time by the forelock, and proposed a reduction in the price for the current year, if the city would extend their contract for ten years. The matter was very adroitly referred to a Committee, which reported back to the Council a proposition to the effect that a new contract for ten years be made with the Royal Company, the price for the first five years to be $124 10 c. per year for a full arc, all night; for the following three years, $120 45 c.; for the remaining two years, $116 80 c.; while during the balance of the term of the old contract (namely the year 1893), the price to be reduced from $146 10 c. to $124 10 c. The Committee submitted a list of prices charged in other cities of about like size with Montreal, from which it would appear that the new price compared fairly well with those now existing elsewhere. But the point was naturally made, that a ten-year contract was a long affair, and that prices might be largely reduced meanwhile. In a general way, it was admitted that the Royal Company had given good service; but there was strong opposition to the city committing itself to such a price for so long a time, particularly as another Company professed to be ready to do the work at $100 per lamp a year. It is, however, only fair to say that the latter price was given only after the Royal Company's figure was made known. It remains to be seen how the matter will end.

The second incident worthy of note in connection with lighting matters in Montreal was the formation of two Companies there to work the Auer incandescent gas-burner. One, the parent Company, had rights for a large part of Canada; and the other, a local Company or licensee, to supply the lights in Montreal. The exploiting of these two Companies has led to a great deal of newspaper correspondence between the advocates of the system and its opponents. To follow the mass of letters, would be tedious and hardly profitable. Suffice it, that the opponents make much of the point that the new solution or fluid discovered by Dr. Auer cannot be patented in Canada; that the mantles cannot be completed there, and must therefore be imported; and that therefore, while the European Company may be desirous of selling lamps in Canada only to their regular licensee, still it cannot prevent any party buying the lamps in London and sending them to Montreal. The subscribers to the Auer Company in the latter city are therefore really paying largely for a right which cannot be guaranteed to them. In this connection, it might be said that if the improved burners are as hard to buy in London as they are in this country, a party would have difficulty in getting sufficient there to supply the Montreal trade.

The Philadelphia Gas-Works continue to receive their full share of criticism from the press of the city; and it can frankly be said it is a little bit refreshing to those who, in other parts of the States, are fighting the question of municipal ownership of lighting plants. We say refreshing, because the advocates of municipal lighting bring forward this nationalistic scheme as the panacea for all the so-called evils

connected with the question of public lighting; and the statements are advanced without reason or argument. When therefore those who are posted upon gas questions bring forward facts, the plain interpretation of which is that municipal gas-works are not as well managed in this country as those owned by corporations, they are held to be actuated in their statements by self-interested motives. Those who thus favour the retention of the gas supply in the hands of private corporations cannot but read with a grim smile such passages as the following from one of the Philadelphia papers:—

The citizens of Philadelphia pay an extraordinarily high price for the gas they consume, and they are entitled to an article guaranteed at 16-candles standard. Either they should receive this, or they should not be compelled to pay for it. They do not receive it at present; the power being one-fourth of the legal standard. The gas furnished shows a thin bluish light that only seems to make the darkness more perceptible. . . . Philadelphia by candle light is no longer a tradition of the olden time. In many distracted homes, it has become a disagreeable necessity. Of course, the so-called Gas Department is still in existence; the pipes have not been taken up and sold for old iron. When darkness comes on, there is a feeble flicker when the match is applied; but, for all practical purposes, the present illuminant is about as low down as was ever known in the history of this or any other town. . . . The wretched gas supply of the hour is a defect for which there is no possible excuse. . . . But there is no excuse for selling gas at the rate of $1 50 c. per 1000 feet. . . . The general rate in other large cities is $1, while in some of the smaller cities it runs down to 50 c.; and yet here in Philadelphia the consumer is forced to pay an exorbitant price for an article which is not of the best quality.

We do not know of many smaller cities where they are getting gas at 50 c.; and the number supplied at $1 is not legion, by any means. Still, considering the geographical position of Philadelphia, and the large output, the price charged there—$1 50 c.—is high in comparison with other places, particularly as the quality is not of the best. We think, however, that a large part of the trouble in Philadelphia is due to the inadequacy of the distribution system. When the powers that be vote a large sum—a very large sum—for new mains, and increase in fact the main system from one end of the city to the other, the citizens of that "abode of brotherly love" may get a fair portion of the light they require, but not till then.

A rather interesting question has arisen in connection with the matter of municipal lighting at Wakefield, Mass. Wakefield is only a small town in the good old Commonwealth of the Pilgrim Fathers, and has been known to fame as the home of the Wakefield rattan goods. Until about five years ago, the Gas Company of the town was practically owned by the Wakefield family; but of late it has changed hands several times, and each time the purchaser has not found it a bonanza on his hands. The Company have also had the supply of electric lights in the town, and (it is held by some) took advantage of monopolistic power to put up the prices all round. This the townsfolk would not stand; and for the lighting of the streets they went back to the so-called good old days of oil. Then the town proposed to build a works of their own; but they were met by the law of 1890, which compels any city or town going into the electric light business to purchase the plants already in existence there. The town tried to secure the passing of a Special Act by the Legislature exempting them from the effects of the 1890 law; but in this they were not successful. Finally, the town went through the formality required by the Act of 1890, to the extent of voting two successive years to go into municipal lighting. But still, hoping that the legislature would authorize them to build, and not buy the established plant, they have not made any move in the matter; and now the Wakefield Gas Company go into Court and say that the town, having voted in accordance with the Act of 1890 to go into municipal lighting, must complete the transaction by purchasing their plant, which they claim is valued at $200,000. In other words, they make the point that, having taken the votes called for by the Act of 1890, it is no longer optional with the town to proceed; but they must do so, by compulsion if necessary. This is certainly an unlooked-for possibility of the Municipal Lighting Act. We have dwelt at length on this small case, because it is one of those instances when a small matter may be productive of big results. For the Wakefield fight in the legislature has threatened the security of every lighting company in the State; for the reason that the townsfolk, seeing they could not secure the passing of a Special Act of exemption, have striven to have stricken out of the municipal lighting law the clause which compels the town to purchase existing companies if it desires to go into gas or electric lighting. It has been said, and perhaps well said, that the lighting companies of Massachusetts would be better off to-day by far if they had clubbed together two years ago and purchased the Wakefield Gas Company, so as to have eliminated this question from the legislative history.

The Edison Company—or its successor, the General Electric Company—has just scored another victory in the incandescent lamp litigation. The Company against which the suit is obtained this time is the Beacon Vacuum Lamp Company, which claimed that its electrician, a Mr. Goebel, made an electric light as long ago as 1854, and therefore its lamp was of prior invention to the Edison. At first the case excited considerable interest, on account of the claims of Mr. Goebel; but the Court decided against the Beacon Company, and granted an injunction as asked for by the Edison Company. The Beacon Company gave notice of an appeal to a higher Court, and very recently tried to have the injunction set aside pending this appeal. But the Court denied the request; so the injunction stands.

It seems to be a fact that people cannot get too much light now-a-days. Note Cleveland, Ohio, as an example. It will be remembered that the citizens of that Municipality are now enjoying the benefits of 80-cent gas; and, as was to have been expected, the amount of gas used there has been largely increased since the reduction in price to the above figure. Now one would suppose that so low a rate for gas—and it certainly appears very favourably in comparison with other cities—would lead to a great falling off in the business of the electric light companies there. Yet this does not seem to be the result; for we note the introduction of a new electric light company, making number three for the city, with the reputed scheme of wiring every street in the city for incandescent electric lighting. Doubtless the scheme of the projectors of the Company is not quite so rash as is here suggested; but appearances indicate that they anticipate a large business, though why they should obtain it in face of the low price for gas, is not very apparent.

It is indeed passing strange how a Municipality makes up figures when it wants to have a good showing. This remark is brought forth by some figures before me as to the cost of electric lighting in the little town of Danvers, Mass., which owns its electric lighting plant. The figures are supposed to show the great saving resulting from a town or city operating a lighting plant for its own service at least. The town has a plant of 90 divided arc lights, which cost $16,000. The number of lights in operation is 80; and the cost of running the lights is given in large type as 19 c. per lamp per night. This, of course, is very much below the price paid by most cities; but the statement is very misleading, to put it mildly, for no allowance is made for interest or depreciation. These two items would not be less than 10 per cent., which would mean 6 c. per light per night; and then the tax which the town would collect from a lighting corporation would represent another 1½ c. per lamp a night. It can thus be said that the lights do not cost the town less, and probably cost more, than 26½ c. a night—a figure which is not so flattering for Danvers.

## ANTWERP WATER-WORKS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Thursday, at the London Offices, No. 86, Cannon Street—Mr. H. G. H. Norman in the chair.

The Secretary (Mr. W. Conway) read the notice convening the meeting; and the report and accounts were taken as read.

The Chairman, before moving the adoption of the report, referred to the severe loss the Company had sustained in the death of Mr. Charles Crew, who for many years was the Managing-Director of the Company at Antwerp, and of late years had filled the position of Chairman. He was sure the shareholders would all join with the Board in the sincere regret they felt at his premature death. Turning to the report and accounts, he said that there had been an increase of £3200 in the gross receipts; and the number of new contracts entered into had been 800, as compared with 567 in 1891, and 616 in 1890. The gross income for the year amounted to £26,249, as compared with £23,688 in 1891; and, after the usual deductions, the net revenue for the year was £11,581, which, added to the balance of £563 brought forward from 1891, made a total of £12,144. This sum was sufficient to pay a dividend of 3½ per cent.; but for special reasons (which he explained) the Board thought it prudent to recommend a dividend of 3 per cent. only. After paying this, a balance of £1680 would remain, of which they proposed to transfer £1200 to the sinking fund, leaving £480 to be carried forward. The Company was now thoroughly established; and it was very satisfactory to be able to state that the hopeful expectations expressed in last year's report had been borne out by the facts. The formation of the Antwerp Hydro-Electric Company had now been accomplished; and the Water Company had received shares to the extent of a face value of £1000. They also expected to obtain from the Company the minimum guaranteed income of £500 a year as from next autumn. As to capital expenditure, they would have to lay a second main from Waelham in the not very distant future; and with regard to the prolongation of the concession, they were keeping this steadily in view, and hoped to bring the negotiations to a successful issue.

Mr. D. Evans seconded the motion, which was carried.

The retiring Directors (Mr. Edward Horner and Mr. W. Blaber) and the Auditors were re-elected.

Mr. Ad. Kemna, the Manager at Antwerp, proceeded to address the shareholders at some length. He said a comparison of the accounts with those for 1891 showed that the Company had made a step forward; and there was every prospect of continued progress.

The usual vote to the Directors concluded the proceedings.

## KIMBERLEY WATER-WORKS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Wednesday, at the Cannon Street Hotel, E.C.—Mr. A. J. Macdonald in the chair.

The notice convening the meeting having been read, the report and accounts (which were alluded to in last week's issue) were taken as read.

The Chairman, in moving the adoption of the report, said the transactions of the past year had been precisely similar to those of the preceding one—if anything, they were slightly in favour as far as expenditure was concerned. Their financial position was pretty strong. It would be observed that the cash liabilities and the dividend together amounted to £12,000, and they had in hand liquid assets of £25,000. He might mention that the balance of £5500 old bonds paid off on Jan. 1, which were not converted, were immediately afterwards taken up. The capital expenditure for the year was more than in 1891; being £917, against £239. This was fully accounted for by their having puddled the circular reservoir, to prevent waste of water by percolation. The general expenses at Kimberley showed a reduction of £300; repairs to premises, £170; and the reduction in the cost of pumping about made up the balance of the total saving of £670 on the working expenses in the Colony. At the last meeting, the Directors were asked to consider a reduction of their fees; but they saw no reason why they should be lowered. They were not now receiving the same amount of remuneration as when the Company were paying a dividend of 12 or 15 per cent., because by the Articles of Association they were to benefit according to the dividend paid; and now the dividend was so low that the Directors did not consider their present remuneration at all excessive. Then as to the management expenses, the salaries of the Manager, Engineer, service superintendent, and storekeeper at Kimberley averaged only about £600 a year each, which was somewhat low for South Africa. In conclusion, he mentioned that the returns for the first three months of the present year had been rather larger than in the corresponding period of 1892.

Mr. J. JACKSON, in seconding the motion, referred at some length to a visit which he paid to Kimberley last year. It was sixteen years since he was previously there; and, in that period, the population had decreased and greatly changed in character. The works were being maintained in good condition. As to the future of the Company, he did not think it was likely they would have a marked increase, unless they had a drought; and, on the other hand, there was not much room for economy in working. The cost of coal had now been brought down to £4 5s. per ton; but when the projected railway from Kimberley to Bloemfontein was completed, they might further reduce it—perhaps 10s. or 15s. per ton.

Mr. FORD strongly commented upon the heavy expenses in Kimberley and London—£20,305 and £3452 respectively; and he thought they might be considerably curtailed. Seeing that the dividend had fallen from 15 to 5 per cent., he thought the Directors ought to reduce their fees; they having in the past thirteen years, received in this way nearly £30,000. The shares for which many of the shareholders had paid £12, were now down to about £3 10s.

Mr. FINLAY thought that what the Company wanted was an increase of business. He found that the consumption of water had fallen from 226,666,915 gallons in 1889 to 121,171,564 gallons in 1892.

Several other speakers followed; complaining of the amount of the expenditure, requesting that further details should be given in the accounts, and expressing the opinion that a change was required in the directorate.

The CHAIRMAN, in reply, said he did not think it was possible to reduce the expenses; and with regard to the Directors' fees, if they were decreased one-half, it would only represent about 5d. per share per annum. If a reduction were made, they would not use the money for dividend purposes, but would write the amount off depreciation.

A resolution was passed "requesting" the Directors to reduce their fees by one-half; and the report was then adopted.

The retiring Directors (Messrs. Jackson and Ryrie) and the Auditors were re-elected; and, a vote of thanks having been passed to the Chairman and Directors, the proceedings terminated.

## PLYMOUTH CORPORATION WATER BILL.

At the Meeting of the Plymouth Borough Council on Monday last week, Mr. J. T. Bond, the Chairman of the Water Committee, presented a report with regard to the promotion of the Corporation Water Bill in Parliament, and other formal matters. He said it would be recollected that in March, 1892, he had entrusted to him the task of expounding to the Council, and recommending to the town the present Burrator reservoir scheme; and that, in pursuance of the directions which the Council had from time to time given, the Committee had taken all proper and statutory steps until that day he had to submit a resolution which was the proper issue of what had occurred. The resolution was as follows: "That if, and so soon as, the Plymouth Bill shall be confirmed by Parliament, all necessary notices to treat be served, and all other steps taken to carry out the works thereby authorized with as little delay as possible." He would first refer to other Bills which had been submitted to the House of Commons. The Stonehouse Bill made provision for the construction of a reservoir on what was known as the Cad site. It was placed before the Committee with a great deal of ability and energy; and was strongly opposed by Mr. Tracy Elliott, as a riparian owner, and the Corporation. The subsequent substantial abandonment of the scheme came as a surprise. It was evident that the Committee could not understand why Stonehouse, which was so well supplied from Plymouth and Devonport, should ask to have a supply of their own. The Plymouth case was next submitted. However, after both the Stonehouse and Plymouth cases had closed, the leading Counsel for Stonehouse suggested that terms should be agreed upon; and this was done, conditionally upon the withdrawal of the Cad scheme. These conditions were that, for the coming two years, their supply to Stonehouse should rise from 690,000 gallons to 1,000,000 gallons per week; that for the following three years the supply should rise to 1,750,000 gallons; reaching after the fifth year a maximum of 500,000 gallons per day. As to payment, they were at present paying on the 690,000 gallons 2½d. per 1000 gallons, and that was the price agreed upon for the 1,000,000 gallons; so that for the first two years of the arrangement, this revenue would increase from £380 to £541 per year. During the following three years, it would increase to £947; and, after the fifth year, the maximum which could be reached would be £1895. In addition to that, Stonehouse was very anxious, why he could not say, to take their own water in bulk from Hartley. There was, however, the difficulty in the way of doing this, that the Compton Gifford Authority could prevent Stonehouse from opening up their roads, and thus cause a block. If they did so, the Plymouth Water Committee would be prepared to do everything they judiciously could to facilitate the overcoming of that difficulty. Then they were under the obligation to purchase as much of the undertaking of the Devonport Water Company as lay within the township of East Stonehouse. They made inquiries in an authoritative place, and were informed that the purchase of these rights, which included "pipes, water, and rights," would involve a capital outlay of from £8000 to £12,000. They agreed that the Devonport Company should continue to supply Pennycross, where their mains were in. They had at present the right concurrently with Plymouth to supply St. Budeaux and the neighbourhood and Crownhill. They had abandoned this, and the whole of the Government establishments from Crownhill downwards to Plymouth. They retired from the Stonehouse position for ever, and also the Mutley Park Estate. Mr. Bond next dealt with the opposition to the Plymouth scheme, and said he regarded this as the most serious which they had to encounter; but terms were agreed upon which, in pursuance of the principle pursued by the Committee, should in due time be made known to the Council and the town. Mr. Elliott formally seconded the resolution, which was adopted.

**Extensions at the Blackburn Gas-Works.**—The Blackburn Corporation have applied to the Local Government Board for power to borrow £10,000 on the revenue of the gas undertaking, for the purpose of erecting a new gasholder, and putting down new mains.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

The "Informal" Meeting of Gas Managers in Glasgow last Wednesday, was a complete success. The turn-out was large—so large, in fact, that the apartment in which the meeting took place was no more than sufficient to hold it. If regret were to be expressed at all in connection with the matter, it is that so many of the leading men in the business, and men from the East, should have been absent. The gathering, owing to the untiring energy of Mr. M'Gilchrist, of Dumbarton, has now established itself as one of the events of the year for gas managers in Scotland; and though, seeing that it was a continuation of the old West of Scotland Association, there might have been a little feeling of rivalry that kept some away, I look upon it that Mr. M'Gilchrist has lived such down, and that the gathering should be recognized by all. The present is, as one of the speakers at the dinner said, a convenient time for gas managers to come together, and have a talk over their experiences during the winter. Is the situation not one in which the North British Association might take up the meeting, and hold it under their own auspices? If they should, members would have the opportunity of attending two gatherings during the year—a privilege which many of their brethren in the South enjoy. The form of the meeting—informal—could be retained, as it is a particularly refreshing method of conducting a meeting of gas managers at a season of the year when they have not had time to prepare formal papers, or to tabulate the results of their winter's working, but are so full of their subject that they can dash off a sufficient amount of information to whet the appetite of the members for more in July. What I would suggest is that, the next time it is convenient for Mr. M'Gilchrist to be elected President of the North British Association, in recognition of his labours in connection with the informal meetings, the Committee of the Association should be charged with the duty of getting up the meeting. That would, while relieving Mr. M'Gilchrist of a burden which he has long borne, and which few would have undertaken so long, retain his services and his experience for the first gathering after the change was made.

To return to the meeting, if it was a success as concerns numbers, it was also conspicuously so as regards the visit to the Dawsholm works. The day was one of the best in the lovely spell of weather which has been experienced since April came in—a day in which an outing to anywhere would have been enjoyed. But when to the loveliness of the weather is added the attraction of seeing a huge gas-works of modern construction at work, and a mammoth gasholder in course of erection, and when it is remembered that everything was as free as day to look at, it will be seen that those who attended had good reason for passing the vote of thanks they did to Mr. Foulis and to the Barrowfield Iron Company, for the generous way in which they had opened their works for inspection. Then the meeting itself was, though short, also a pronounced success. Mr. Wilson, the Chairman, made a judicious selection of subjects on which to address the gathering; but he was more judicious still in the length of his remarks. A shorter Chairman's address has seldom, if ever, been heard; and nothing could have been fitter for such an occasion. The wisdom of his policy was shown by the prompt way in which the meeting took up and discussed the points he had treated of. Every one of them was dealt with; but it was decidedly upon Mr. Young's oil-gas process that the interest of the meeting centred. One could not help feeling that on this subject some of the gentlemen were a little too critical, and seemed to forget that the statements made by Mr. Bell and Mr. Yuill were not made at random, but were based upon recorded experience. There is this excuse for those who criticized, however, that the subject was not fully gone into by either Mr. Bell or Mr. Yuill; and inconsistencies may have appeared to some which fuller information would have cleared away. Mr. Bell is to bring the subject before the North British Association in July; and being now forewarned of the points on which some have doubts, he can address himself the more fully to them. If there was a notion in the minds of any that the Peebles process is not all that it is held out to be, it should be dispelled by the knowledge that the system has been worked all the winter with the utmost openness, and by Mr. Bell's invitation to all to visit Peebles and see the plant at work. The passage over the subject of oil gas was lively, but it did not in the least interfere with the harmony of the meeting; and most probably it added to its usefulness, by bringing out or emphasizing what would perhaps not have been made so clear. Altogether the gathering is one which ought to be continued; and Mr. M'Gilchrist deserves congratulations on the manner in which he made the arrangements and superintended their execution.

The Waverley Association of Gas Managers, which claims to be the oldest of all the Associations, held their sixty-fourth half-yearly meeting at Dalkeith on Thursday. As at the "Informal" meeting in Glasgow on the preceding day, the communings of the members turned chiefly upon the Peebles process of enriching gas by oil. Mr. A. Bell, of Peebles, is a member; and he introduced the subject in much the same terms as he did in Glasgow. He, however, illustrated his remarks by references to diagrams of the plant to be erected in the gas-works at Musselburgh. All the members who took part in the discussion spoke favourably of the process—as was to be expected, seeing that several of them have themselves adopted it.

The Lord Provost's Committee of the Edinburgh Town Council on Wednesday approved, by 12 votes to 4, of the recommendation of their Sub-Committee on Electric Lighting, that the Corporation should themselves undertake the work of laying down and managing the proposed electric lighting installation. It cannot be said that in doing so they have very accurately gauged the feelings of the community; for yesterday some of the leading merchants in Princes Street, who are expected to be the best customers of the undertaking, framed a memorial to the Town Council, in which they express their conviction that such a course would be against the best interests of the city, looking to the fact that there is a thoroughly substantial local company willing to undertake the initiatory risk. They state that some of the advantages which the citizens as a whole would derive, should the Town Council delegate the electric lighting to a local company, would

be as follows: (1) None of the citizens who are not consumers would be taxed for the introduction of the new illuminant; (2) a company is in a better position to carry through the undertaking satisfactorily than the Town Council, seeing that the members of the latter are already overtaxed; (3) a company would be more popular with all classes of the community, and consequently would be able to secure a very much larger number of consumers. Though the petition was only drawn up yesterday, there are already about 100 signatures to it, the signatories consisting of the members of the largest firms in the street. It is intended to ask the Town Council to delay coming to a decision on the subject until the opinion of the citizens may be taken; and a public meeting for the purpose is spoken of as likely to be held.

It is announced, in a Dundee newspaper, that, from the results which have been ascertained in the annual stock-taking in the Dundee Gas-Works, there is every probability of a considerable surplus being realized at the end of the current year. The revenue is already larger by several thousand pounds than it was in the same period of last year. This is partly accounted for by the price of the gas being raised from 3s. 8d. to 3s. 9d. per 1000 cubic feet, but also by the fact that there has been a substantial increase in the output. It is not, the writer says, likely that there will be any reduction in the price of gas, because "any probable burden arising from the introduction of the electric light will require to be borne by the Gas Commissioners." People who have to pay more for their gas because other people use electric light and do not pay a full price for it, will not feel in an amiable mood when they find the position the so-called policy of progress has placed them in.

The Perth Gas Commission have had under consideration a report by Mr. Whimster, the Gas Manager, recommending the adoption of the Peebles oil-gas process; but they have resolved in the meantime to delay coming to a decision on the subject. This resolution has been arrived at in consequence of the low price at present ruling for coal. Mr. Whimster visited Peebles, in order to satisfy himself as to the value of the plant; and he is convinced that its introduction into the Perth Gas-Works would enable him to effect a great saving in the cost of output.

The second failure of the street lighting of Glasgow by arc lamps, took place on Sunday night last. This time it was the lamps in the centre of George Square which would not light up. I learn that the first failure was due to the overheating of a bearing in the works; and the second, to the slipping of the rope-belting.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 15.

**Sulphate of Ammonia.**—The market is again improving; and to-day's quotations are enhanced by about 2s. 6d. per ton. The requirements seem to emanate mainly from the dealers, who evidently have still contracts to complete. Continental buyers are operating sparingly, as may be expected; present prices being so contrary to their anticipations. The demand is principally for prompt lots; but all April parcels can hardly be secured much under spot prices—the fact being that it becomes more difficult daily to buy sulphate, stocks being completely exhausted, and the production rapidly declining through the exceptional weather. A continuation of the present condition of things would mean a famine of sulphate during the summer; and this would be a very serious matter to consumers who have no stocks, and are leaving themselves without their usual supplies in anticipation of coming business. Even the Scotch producers appear to have a notion of such an event, as they have at any rate ceased their hasty selling forward. The shipments continue on a large scale; and the Hull strike is not interfering quite so much with the trade as was at one time feared. To-day's quotation at the ports is £12 12s. 6d. per ton. Nitrate has advanced to 10s. 10½d. per cwt.

LONDON, *April* 15.

**Tar Products.**—The benzol market is without life; and if anything prices are rather easier than last week. Some important business has been reported in pitch for delivery between now and the end of the year; but at prices somewhat disappointing to the sellers. The demand for pitch continues brisk; and contracts are being fully taken up. There seems no probability of an advance in the value of this article; but, on the other hand, its position is firm enough to warrant belief in the current figures being maintained. Anthracene prices are upheld; but Continental buyers defer covering their requirements as long as possible, in the hope of seeing reduced prices. Continental stocks, however, must be getting to a low ebb; and the evil day cannot be much longer deferred. Carbolic acid has been somewhat easier towards the end of the week; but inquiries are again more brisk, both for this and cresylic acid. Creosote is at a very low figure; and sellers seem disposed to take almost any price that is offered—the lessening output, however, and the increased consumption for pickling purposes, should influence this market for the better. To-day's prices are: Tar, 12s. 6d. Pitch, 24s. to 25s. 6d. Benzols, 90's, 1s. 7d.; 50's, 1s. 5d. Solvent naphtha, 1s. 1½d. Toluol, 1s. 4½d. Crude benzol naphtha, 30 per cent., 7d. Creosote, ¾d. Creosote salts, 17s. Carbolic acid, 60's, 2s. 3d.; 75's, 2s. 10d.; crystals, 7½d. Cresol, 2s. Anthracene, nominal, 30 per cent., "A," 1s. 1d.; "B," 9d.

**Sulphate of Ammonia** is scarcely so strong as last week; but considering the sudden rise, it is remarkable that the check it has received has been so slight, and is further evidence of the strong and fully justified position which sulphate holds to-day. Prices may be taken as £12 7s. 6d. to £12 12s. 6d., less 3½ per cent. Gas liquor is quoted at 8s. 6d. to 9s. 6d.

**Mr. D. Terrace on "Using Gas."**—At the monthly meeting of the Middlesbrough Association of Engineers and Draughtsmen, on the 8th inst., Mr. D. Terrace, the Corporation Gas Manager, read a paper on "The Best Means of Using Gas for Lighting Purposes." It proved of a very able and instructive character, and was made additionally interesting by a series of limelight views. Discussion followed. A vote of thanks was accorded to Mr. Terrace.

## COAL TRADE REPORTS.

**From Our Own Correspondents.**

**Lancashire Coal Trade.**—One of the chief matters still occupying attention in the coal trade of this district, is with reference to the revised railway rates, and the weight carried by the companies. At a meeting of the South Lancashire and Cheshire Coalowners' Association, held on Tuesday, reports were received as to the action the railway companies have up to the present taken in meeting the complaints of the colliery owners; and so far, they do not seem to have put the rates on at all a satisfactory footing generally. The Manchester Coal Traders' Association have also had a meeting on the question; but amongst the members of this Association the chief complaint is that, under the new arrangement, short weight is frequently being received. It is strongly urged that the railway companies should be compelled to put down weighing-machines, to weigh out the coal as it is delivered to the consignees. With regard to trade, all descriptions of round coal are meeting with a lessened demand. Best Wigan Arley, at the pit mouth, does not now average more than 11s. 6d. to 12s.; Pemberton four-feet and second qualities of Arley, 9s. 6d. to 10s.; and common house-fire coals, 7s. 6d. to 8s. per ton. Common round coals are more difficult to dispose of for iron making, steam, and general manufacturing purposes; and with regard to these, it is more a question of effecting sales than of holding to what are simply nominal list rates. For inland sales, 6s. 6d. to 7s. per ton, at the pit mouth, represent quite the full average prices obtainable; whilst for shipment, it is only in exceptional cases where more than 8s. is being got for steam coal, delivered at the ports on the Mersey. For engine classes of fuel, there has been rather a pressure of demand, owing to the limited supplies now offering in the market; and in a good many cases, prices have been put up about 3d. to 6d. per ton. It can scarcely be said, however, that any really appreciable advance upon recent full prices is being at all readily obtained from consumers. At the pit-mouth, best qualities of burgy average about 6s. 6d.; the better qualities of slack, 5s. to 5s. 6d.; and the lower qualities, 3s. 9d. to 4s. 3d. per ton.

**Northern Coal Trade.**—There has been a slightly improved demand for coal, because of the opening of more of the Baltic ports for the season. Best Northumbrian steam coals are mainly in demand; and prices are very firm at 8s. 6d. per ton f.o.b. Second-class coals are not yet in such full demand; and their price is about 8s. per ton f.o.b. Small steam coals are steady, at from 3s. to 3s. 3d. per ton. Manufacturing coals are generally dull; but there is a good demand for smithy coals, though prices vary from 7s. 6d. to 9s. per ton. For gas coals, there is a lessened local demand; but exports are beginning to be increased. The price asked for gas coals is nominally 6s. 6d. per ton for best. But there are many sales below that price, and contracts are now generally on a basis that is nearer 6s. per ton f.o.b. Coke is steadier; best Durham qualities being from 13s. 6d. up to 15s. per ton. Gas coke is now being produced in more limited quantities; and hence there is a reduction of stocks in some cases—the manufacturing demand being steady. The price is unaltered.

**Scotch Coal Trade.**—No improvement in the demand for coal can yet be recorded in Scotland. Ell is the only variety which is selling at all freely—considerable quantities of it being shipped to Baltic ports. In some instances, the miners are only working two shifts per week; and yet, notwithstanding the restricted output, the railway sidings are everywhere getting blocked with loaded waggons. The prices quoted are not reliable, as even lower terms can be got. They are as follows:—Main, 6s.; ell, 6s. 9d. to 7s.; splint, 6s. 3d. to 6s. 6d.; and steam, 8s. per ton—all f.o.b. Glasgow. The shipments for the week amounted to 127,695 tons—a decrease of 13,432 tons as compared with the preceding week (nearly all of which was due to a falling off in the exports from West Coast ports), and of 12,175 tons as compared with the corresponding week of last year. For the year to date, the total exports have been 1,512,830 tons—a decrease, as compared with the same period of last year, of 147,345 tons.

**Electric Lighting by Gas Companies.**—The introduction of the electric light into Warsaw having been decided upon, two French, one Belgian, and two German firms have, says *Iron*, applied for the concession. It is stated that the German Continental Gas Company's offer has the best chance of being accepted.

**Water Supply in India.**—The Government of Bengal have determined upon the construction of water-works for supplying the various riparian districts commencing at Pulta, and extending to the commencement of the city of Calcutta. The works will be designed by Mr. J. Kimber, M.Inst.C.E., the Water Engineer to the Corporation; the Consulting Engineers in London being Messrs. Joseph Quick and Son, MM.Inst.C.E.

**San Paulo Gas Company, Limited.**—The Directors of this Company in their report state that the net profit for the six months ended Dec. 31 last was £8138, which with the amount brought forward makes a total of £11,516. The Directors recommend the payment of a dividend at the rate of 5 per cent. per annum for the half year, tax free; that £2000 be placed to renewals and contingencies account; and that £3147 be carried forward.

**The City of London Electric Lighting Company's Depreciation Fund.**—At the meeting of the Commissioners of Sewers of the City of London last Tuesday, the Finance Committee presented a report on the subject of the application by Mr. Morse, on behalf of the City of London Electric Lighting Company, for the Commissioners' consent, as the Local Authority, to the introduction of a Bill for amending section 8 of their Electric Lighting Order (*re* setting aside 7½ per cent. on the capital expended for depreciation). The matter was before the Commissioners on the 21st ult. (see *ante*, p. 550). The Committee recommended, after further consideration, that the Commissioners agree that such 7½ per cent. be on the outlay for plant and machinery, &c., as defined by the Board of Trade, and that 5 per cent. on the net profits be set aside as a reserve fund; the Company, however, to be at liberty to write off as depreciation such further sum as they think proper, or as they may be required to do by the Board of Trade—not exceeding in the whole 7½ per cent. The report was adopted.

**The Price of Gas in Manchester.**—The Gas Committee of the Manchester Corporation have decided not to recommend a reduction in the price of gas during the coming year. Their estimates for 1893-4 will be based upon the present price of gas—viz., within the city 2s. 6d., and beyond the city 3s. per 1000 cubic feet.

**Metropolitan Electric Supply Company, Limited.**—The report of this Company for the year ended December 31 last states that the capital expenditure, which at the end of 1891 amounted to £486,926, now stands at £550,859. This increase is chiefly due to the laying of additional mains, and to the works in connection with the new station at Paddington, which was not contemplated in the original estimates. For the purpose of completing the Company's present system, it will be necessary to issue the balance (£50,000) of the £100,000 debentures already authorized. The gross revenue for the past year amounted to £54,571, as against £43,747 in 1891; but the revenue of that year included a special item of £3027 paid by the contractors. The actual increase, therefore, amounts to £13,851. The balance to the credit of the revenue account, before providing for depreciation, is £18,168. The Directors have set aside £4000 as a depreciation fund, carrying £14,168 to the net revenue account, which, with the balance brought forward and other receipts, makes a total of £15,144. After deducting bank charges, debenture interest, &c., there is a balance of £12,558, of which the Directors have appropriated £1000 in reduction of the preliminary expenses account, which will now stand at £4052. A dividend of 4s. per share is recommended; carrying forward £1578.

**Fatality at the Birmingham Gas-Works.**—At Birmingham yesterday week the City Coroner (Mr. O. Pemberton) held an inquiry touching the death of Matthew Leonard, a labourer employed by the Corporation at Saltley Gas-Works, who received injuries on the 28th ult., which resulted in his death the previous Thursday. On the day of the accident, deceased was employed in one of the retort-houses cleaning out pipes. While in the house, which is of considerable length, the charging-machine proceeded along the rails at the rate of a mile an hour. The distance between the wall of the house and the machine is 8 inches; and the deceased, who saw the machine coming towards him, instead of escaping by one of two doorways provided for the purpose, stood with his back to the wall, thinking that the machine would pass him. The space between the machine and the wall, however, was too small to allow of the machine passing him; and he was badly crushed about the abdomen. As soon as the man's position was seen, the machine was brought to a standstill. He was released and taken to the General Hospital; but he succumbed to his injuries. In addressing the jury, Mr. Pemberton said that Mr. S. H. Knynett (Inspector of Factories) had suggested that an additional refuge should be made in the wall of the retort-house. The jury returned a verdict of "Accidental death," and added that the deceased contributed to his own death, and that there was no blame whatever to be attached to anyone. They thought that the suggestion made by the Inspector of Factories should at once be carried out, and suggested themselves that a warning to the workmen should be posted in the retort-house. Mr. Bell, who appeared on behalf of the Corporation, said he would lay the suggestion before the proper authorities; and, referring to the posting of the warning, he said it was apparent to the deceased that he could not pass between the machine and the wall.

**Action for Damages against the Chelmsford Gas Company.**—On Monday last week, at the Chelmsford County Court, before his Honour Judge Paterson, an action was heard, under the Employers' Liability Act, in which William Weston, a fitter, formerly in the employ of the Chelmsford Gas Company, sought to recover from them £100 damages through an accident he met with while in their service. Before the case commenced, the Judge and Counsel, with the plaintiff and the Company's officials, visited the gas-works and inspected the machinery. Plaintiff stated that the accident occurred on Sept. 14, while he was assisting the Manager (Mr. E. G. Smithard) in disconnecting the pump-valves from the engine. He forced the valve out on one side; while Mr. Smithard received it on the other, and took it away to examine it. He meanwhile reached over the steam-pipe to take up the nuts and bolts which were on the floor, and the under part of his right arm caught on the steam-pipe, which was hot, and caused him to flinch. The engine was in motion, and the fly-wheel knocked his shoulder, and forced his body and arm forward until the middle finger of his right hand came in contact with the plunger; the result being that the top of the finger was cut off below the first joint. Mr. C. L. Martin, a surgeon, gave evidence as to the injury; and Mr. A. Mead, formerly the Company's Engineer, said, in his opinion, the engine should have been stopped before the valve was taken off. For the defence, Mr. Smithard said he gave no further order beyond that of removing the valve; nor was it necessary to pick up the bolts, as they would be in the very place where they would be required to be used again. His Honour held that plaintiff did a thing he was not actually obliged to do, and that in doing it—knowing as he did that the engine was in motion—he did not exercise reasonable care. He therefore gave judgment for the defendants.

**Fylde Water-Works Company.**—In their half-yearly report, the Directors of this Company recommended, from a balance of £10,122, a dividend of 4 per cent. per annum on the preference stock; and 10 and 7 per cent. respectively on stock "A" and "B"—leaving £1475 to be carried to the next account. The works for bringing the waters of the Calder River and Calder Dyke to the reservoirs are fast approaching completion.

**The Public Lighting of Leeds.**—At a meeting of the Lamp Committee of the Leeds Corporation last Thursday, it was resolved to recommend the Council to levy a lamp-rate for the ensuing year of 4½d. in the pound. The rate last year was only 4d.; the increase being due to the extra expenditure on the lighting of the thoroughfares. There are at present 9471 public lamps in the city, 569 of which have been fixed during the past year. The 4d. rate realized £19,166; and it is estimated that £21,584 will be raised by the new rate.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 676.)

| Issue. | Share | When ex-Dividend. | Dividend or Div. & Bonus. | NAME. | Paid per Share | Closing Prices. | Rise or Fall in Wk. | Yield upon investment. |
|---|---|---|---|---|---|---|---|---|
| £ | | | p. c. | GAS COMPANIES. | | | | £ s. d. |
| 590,000 | 10 | 13 Apl. | 10½ | Alliance & Dublin 10 p. c. | 10 | 16½–17½* | .. | 6 0 0 |
| 100,000 | 10 | ,, | 7½ | Do. 7 p. c. | 10 | 12–13* | +1 | 5 15 5 |
| 300,000 | 100 | 3 Jan. | 5 | Australian (Sydney) 5 % Deb. | 100 | 104–106 | .. | 4 14 2 |
| 100,000 | 20 | 30 Nov. | 8 | Bahia, Limited | 20 | 11–12 | .. | 13 6 8 |
| 200,000 | 5 | 16 Nov. | 7½ | Bombay, Limited | 5 | 5¾–6¼ | .. | 6 0 0 |
| 40,000 | 5 | ,, | 7½ | Do. New | 4 | 4–4¼ | .. | 6 13 4 |
| 380,000 | Stck. | 24 Feb. | 11½ | Brentford Consolidated | 100 | 215–219 | .. | 5 5 0 |
| 180,000 | ,, | ,, | 8½ | Do. New | 100 | 168–173 | .. | 4 18 3 |
| 220,000 | 20 | 15 Mar. | 11½ | Brighton & Hove Original | 20 | 41–43 | .. | 5 6 11 |
| 888,500 | Stck. | 31 Aug. | 5 | Bristol | 100 | 104–107 | +1 | 4 13 5 |
| 320,000 | 20 | 13 Apl. | 11½ | British | 20 | 41–13* | .. | 5 6 11 |
| 50,000 | 10 | 15 Mar. | 11½ | Bromley, Ordinary 10 p. c. | 10 | 19–20 | .. | 5 15 0 |
| 51,510 | 10 | ,, | 8½ | Do. 7 p. c. | 10 | 14½–15½ | .. | 5 9 8 |
| 328,750 | 10 | — | — | Buenos Ayres (New) Limited | 10 | 5½–6½ | –½ | — |
| 200,000 | 100 | 3 Jan. | 6 | Do. 6 p. c. Deb. | 100 | 98–100 | .. | 6 0 0 |
| 150,000 | 20 | 24 Feb. | 8 | Cagliari, Limited | 20 | 25–27 | +1 | 5 18 6 |
| 550,000 | Stck. | 14 Oct. | 12½† | Commercial, Old Stock | 100 | 247–252 | +2 | 4 19 2 |
| 165,000 | ,, | ,, | 9½† | Do. New do. | 100 | 187–192 | .. | 4 18 11 |
| 160,762 | ,, | 15 Dec. | 4½ | Do. 4½ p. c. Deb. do. | 100 | 127–132 | .. | 3 8 2 |
| 800,000 | Stck. | 15 Dec. | 13 | Continental Union, Limited | 100 | 231–236 | +2 | 5 10 2 |
| 200,000 | ,, | ,, | 10 | Do. 7 p. c. Pref. | 100 | 190–195 | .. | 5 2 7 |
| 75,000 | Stck. | 15 Mar. | 10 | Crystal Palace District | 100 | 187–192 | .. | 5 4 2 |
| 486,090 | 10 | 27 Jan. | 10 | European, Limited | 10 | 21–22 | .. | 4 10 11 |
| 354,060 | 10 | ,, | 10 | Do. Partly paid | 7½ | 14½–15½ | .. | 4 17 0 |
| 5,596,560 | Stck. | 10 Feb. | 12 | Gaslight & Coke, A, Ordinary | 100 | 220–225 | .. | 5 6 8 |
| 100,000 | ,, | ,, | 4 | Do. B, 4 p. c. max. | 100 | 95–99 | .. | 4 0 10 |
| 665,000 | ,, | ,, | 10 | Do. C, D, & E, 10 p.c. Pf. | 100 | 260–265 | .. | 3 15 6 |
| 30,000 | ,, | ,, | 5 | Do. F, 5 p. c. Prf. | 100 | 115–120 | .. | 4 3 4 |
| 60,000 | ,, | ,, | 7½ | Do. G, 7½ p. c. do. | 100 | 165–170 | .. | 4 8 2 |
| 1,300,000 | ,, | ,, | 7 | Do. H, 7 p. c. max. | 100 | 167–171 | +1 | 4 1 10 |
| 463,000 | ,, | ,, | 10 | Do. J, 10 p. c. Prf. | 100 | 260–265 | .. | 3 15 6 |
| 476,000 | ,, | ,, | 6 | Do. K, 6 p. c. Prf. | 100 | 155–159 | +1 | 3 15 6 |
| 1,061,150 | ,, | 15 Dec. | 4 | Do. 4 p. c. Deb. Stk. | 100 | 124–128 | +1½ | 3 2 6 |
| 294,850 | ,, | ,, | 4½ | Do. 4½ p. c. do. | 100 | 130–134 | +2½ | 3 7 2 |
| 908,000 | ,, | ,, | 6 | Do. 6 p. c. do | 100 | 169–173 | +1½ | 3 9 4 |
| 3,800,000 | Stck. | 16 Nov. | 12 | Imperial Continental | 100 | 228–231 | .. | 5 3 10 |
| 75,000 | 5 | 30 Nov. | 6 | Malta & Mediterranean, Ltd. | 5 | 4½–5 | .. | 6 0 0 |
| 560,000 | 100 | 4 Apl. | 5 | Met. of Melbourne, 5p. c. Deb. | 100 | 105–107 | .. | 4 13 4 |
| 541,920 | 20 | 16 Nov. | 5 | Monte Video, Limited | 20 | 13½–14½ | .. | 6 18 0 |
| 150,000 | 5 | 30 Nov. | 10 | Oriental, Limited | 5 | 7¾–8¼ | .. | 6 1 2 |
| 60,000 | 5 | 29 Mar. | 7 | Ottoman, Limited | 5 | 4–4½ | .. | 7 7 4 |
| 166,870 | 10 | — | 2 | Pará Limited | 10 | 2–2½ | .. | — |
| 420,000 | 100 | 2 Nov. | 6 | People's Gas of Chicago— 1st Mtg. Bds. | 100 | 103–107 | .. | 5 12 1 |
| 500,000 | 100 | 1 Dec. | 6 | 2nd Do. | 100 | 100–105 | .. | 5 14 3 |
| 150,000 | 10 | — | 10 | San Paulo, Limited | 10 | 9–10 | .. | — |
| 500,000 | Stck. | 24 Feb. | 15½ | South Metropolitan, A Stock | 100 | 290–295 | .. | 5 5 0 |
| 1,350,000 | ,, | ,, | 12 | Do. B do. | 100 | 240–245 | +2 | 4 17 11 |
| 230,030 | ,, | ,, | 13 | Do. C do. | 100 | 245–250 | .. | 5 4 0 |
| 750,000 | ,, | 13 Jan. | 5 | Do. 5 p. c. Deb. Stk. | 100 | 145–149 | +½ | 3 7 2 |
| 60,000 | Stck. | 15 Mar. | 11½ | Tottenham & Edm'nton, "A" | 100 | 225–230 | .. | 5 0 0 |
| | | | | WATER COMPANIES. | | | | |
| 744,897 | Stck. | 30 Dec. | 10 | Chelsea, Ordinary | 100 | 262–266 | .. | 3 15 3 |
| 1,720,252 | Stck. | 29 Mar. | 8 | East London, Ordinary | 100 | 210–214 | .. | 3 14 10 |
| 544,440 | ,, | 30 Dec. | 4½ | Do. 4½ p. c. Deb. Stk. | 100 | 142–145 | .. | 3 2 1 |
| 700,000 | 50 | 15 Dec. | 8½ | Grand Junction | 50 | 110–113 | .. | 3 15 2 |
| 708,000 | Stck. | 10 Feb. | 11 | Kent | 100 | 278–283 | +1 | 3 17 9 |
| 1,043,800 | 100 | 30 Dec. | 9½ | Lambeth, 10 p. c. max. | 100 | 238–243 | .. | 3 18 2 |
| 406,200 | 100 | ,, | 7½ | Do. 7½ p. c. max. | 100 | 197–202 | .. | 3 14 6 |
| 285,000 | Stck. | 29 Mar. | 4 | Do. 4 p. c. Deb. Stk. | 100 | 129–132 | .. | 3 0 7 |
| 500,000 | 100 | 10 Feb. | 12½ | New River, New Shares | 100 | 326–331 | +3 | 3 13 3 |
| 1,000,000 | Stck. | 27 Jan. | 4 | Do. 4 p. c. Deb. Stk | 100 | 133–137 | .. | 2 18 5 |
| 902,300 | Stck. | 15 Dec. | 6½ | S'thwk & V'xhall, 10p. c. max. | 100 | 163–168 | +1 | 3 17 4 |
| 126,500 | 100 | ,, | 6½ | Do. D 7½ p. c. do. | 100 | 145–150 | .. | 4 6 8 |
| 1,155,066 | Stck. | 15 Dec. | 10 | West Middlesex | 100 | 260–265 | .. | 3 15 6 |

*Ex Div.

† Next dividend will be at this rate.

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RICH IN ILLUMINATING POWER AND YIELD OF GAS.

ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.

MAINTAINS A HIGH STANDARD IN RESIDUALS.

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TELEPHONE No. 2698.

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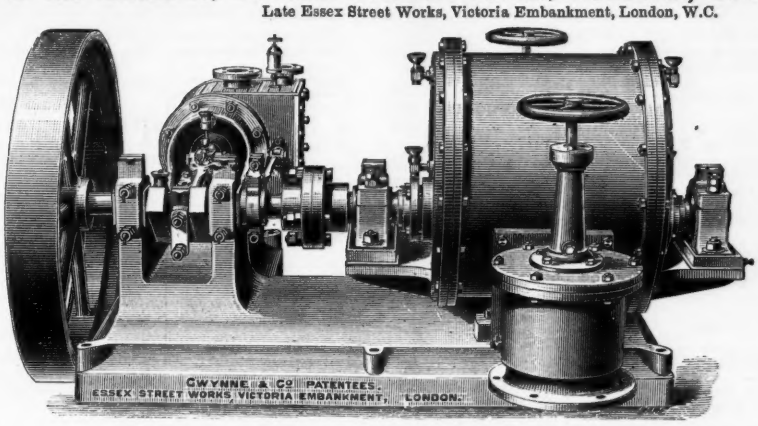
Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.

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*Catalogues and Testimonials sent on Application.*

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

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Makers of GAS-VALVES HYDRAULIC REGULATORS VACUUM GOVERNORS STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works raising Sewage, &c.

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*** See Advertisement p. III., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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**WANTED, a Works Manager at the** Company's Grangetown Station. Salary commencing at £200 per annum, with House, Coal, Gas, &c., free.
Applications, stating age and experience, accompanied by *copies* of not more than three recent Testimonials, to be sent in by Thursday, May 4, 1893, to Mr. H. Morley, the Engineer, and endorsed "Works Manager."

By order,
GEORGE CLARRY,
Secretary.

Cardiff, April 12, 1893.

**WANTED, an experienced Gas-Fitter,** one accustomed to Main and Service laying, Meter repairing, Indexing, and General Work.
Apply, in own handwriting, stating age, experience, and wages required, to the MANAGER, Gas-Works, SELBY.

**WANTED, Gas Liquor.**
Address GEORGE DOBSON, LIMITED, CARDIFF.

**FOR SALE—Purifier Valve, eight-way** (6-inch), by Cockey, Frome, in good condition.
METERS, second-hand, two and three light; surplus stock.
Apply to the SECRETARY, Gas Company, Solihull, WARWICKSHIRE.

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**FOR SALE, at the Redhill Gas-Works,** Surrey—Four 12 feet square PURIFIERS, 6 feet deep, with Centre-Valve and Traveller, T-iron Bearers, and Wood Grids, complete, price £250.
Applications to undersigned.
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**A GAS Company in South Wales offer** 2000 tons of good, clean COKE BREEZE FOR SALE, delivered f.o.b., or on Rail, at 2s. per ton (21 cwt.)
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GASHOLDER, 35 ft. by 14 ft.
GASHOLDER and Cast-Iron TANK, 30 ft. by 17 ft.
Four PURIFIERS, 12 ft. square by 4 ft. 6 in. deep.
Cast-Iron SCRUBBER, 36 ft. high by 10 ft. diameter.
CONDENSERS to pass 500,000 cubic feet per diem.
EXHAUSTER to pass 20,000 cubic feet per hour.
Also various other sizes of above or any Gas Plant. Inquiries invited.
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**FOR SALE—(1) Combined Engine and** EXHAUSTER, with Compensating Hydraulic Governor (Laidlaw); passes 7500 cubic feet per hour.
(2) STATION METER, Cylindrical, with 6-inch Bye-Pass.
(3) STATION GOVERNOR (Milne); 8-inch Connections.
The above are being displaced, in consequence of extensions, and can be seen at the Gas-Works, Portobello, N.B.
DAVID VASS,
Manager and Secretary.

RUSHDEN AND HIGHAM FERRERS DISTRICT GAS COMPANY, LIMITED.

**IN consequence of the Amalgamation of** the Rushden and Higham Ferrers Gas Companies, and the erection of entirely new Works, the Directors of the above Company have the following PLANT FOR SALE:—
One TWO-LIFT GASHOLDER. Outer Lift, 35 ft. by 15 ft.; inner do., 33 ft. 6 in. by 15 ft.
One SINGLE GASHOLDER, 35 ft. by 12 ft.
One TWO-LIFT GASHOLDER, 30 ft. by 20 ft.
SCRUBBER.
PIPE and ANNULAR CONDENSERS.
PURIFIERS.
STATION METERS.
RETORT IRONWORK, HYDRAULIC MAINS.
Various VALVES and CONNECTIONS.
For particulars and permission to view, apply to JNO. T. LEWIS, Engineer, Gas-Works, WELLINGBOROUGH.

TYNEMOUTH GAS COMPANY.

**THE Directors of the Tynemouth Gas** Company are prepared to receive TENDERS for the supply and erection of a BEALE GAS EXHAUSTER, with STEAM-ENGINE and COMPENSATING GOVERNOR, to pass 60,000 cubic feet per hour.
The Directors do not bind themselves to accept the lowest or any tender.
Tenders to be delivered, at the Gas Company's Office, Bedford Street, North Shields, on or before the 2nd of May, 1893.
W. HARDIE, jun.,
Engineer.
North Shields.

## FARNHAM GAS COMPANY, LIMITED.

TENDERS FOR COAL.

**THE Directors of the Farnham Gas Com-** pany, Limited, are prepared to receive TENDERS from Persons willing to supply and deliver free of all Dues and Charges, at the Farnham Station, London and South-Western Railway, 1900 tons of the following descriptions of GAS COAL—viz., New Pelton, Pelaw Main, Aldwarke Main, or Strafford Silkstone—to be delivered in quantities of 50 tons (at intervals) before the 31st of March, 1894. The Coals to be consigned to the order of the Farnham Gas Company, Limited, at the Farnham Railway Station.
In the case of Seaborne Coal, the Meter's Certificate of each quantity to be duly sent with Invoice of same.
Payment monthly, two days after the ordinary meeting of the Directors.
Sealed tenders, marked "Tender for Coal," to be delivered to the Secretary, Mr. W. Wells, 112, West Street, Farnham, Surrey, not later than Eleven o'clock a.m., on Monday, the 1st of May, *of whom Forms of Tender may be obtained.*
The Directors reserve the right to reject the lowest or any tender.
April 18, 1893.

## WIRKSWORTH GASLIGHT & COKE COMPANY.

TAR AND LIQUOR.

**THE above Company are prepared to** receive TENDERS for TAR and LIQUOR made at their Works from May 1, 1893, to April 30, 1894.
Probable quantity: Tar, 8000 gallons; Liquor, 12,000 gallons.
The Tar will be placed on Rail in Buyer's Tanks at the Wirksworth (Midland) Station.
Sealed tenders, endorsed "Tar" or "Liquor," must be sent to the Chairman (T. Newton, Esq.), on or before the 25th day of April.
JAMES LEE, Secretary.

## BRIERLEY HILL DISTRICT GASLIGHT COMPANY.

**THE Directors of the above Company** are prepared to receive TENDERS for the surplus TAR, for One year ending April 30, 1894, made at their Brierley Hill and Kingswinford Works, delivered into Boats at the former place in One hour, and the latter place in Twelve hours.
Tenders to be sent in, endorsed "Tender for Tar," not later than May 6, 1893.
The Directors do not bind themselves to accept the highest or any tender.
HENRY M. JACKSON,
Secretary.
Board-Room, Gas-Works,
Brierley Hill, April 17, 1893.

TENDERS FOR GAS COALS.

**THE Directors of the Exmouth Gas** Company are prepared to receive TENDERS for the supply of 2000 tons of screened or unscreened fresh wrought GAS COALS.
Tenders to be for price f.o.b. and c.i.f. at Exmouth Docks, between the 1st of July next and the 30th of June, 1894, accompanied by Working Analysis.
Sealed tenders, addressed to the Chairman, and endorsed "Tender for Coal," to be sent in not later than the 1st day of May, 1893.
The Directors do not pledge themselves to accept the lowest or any tender.
By order,
JAMES T. FOSTER,
Secretary.
April 13, 1893.

## ULVERSTON LOCAL BOARD.

TAR DISTILLERS.

**THE Gas and Water Committee invite** TENDERS for the surplus TAR produced at these Works during the Year ending the 30th of June, 1894.
Further Particulars and Forms of Tender may be had on application to the undersigned.
Tenders, endorsed "Tender for Tar," to be sent in addressed to the Chairman of the Gas and Water Committee, not later than the 27th inst.
The Committee do not bind themselves to accept the highest or any tender.
JNO. SWAN,
Engineer and Manager.

## BOROUGH OF BEVERLEY.

TENDERS FOR TAR.

**THE Corporation of Beverley desire to** receive TENDERS for the purchase of the surplus TAR at the Gas-Works for One Year from the 1st day of May next.
The Tar will be delivered by the Corporation at the Railway Station, Beverley, into Tanks, to be provided by the Contractor.
Tenders, endorsed "Tender for Tar," must be delivered at my Office, on or before the 24th day of April inst.
Further particulars may be obtained of the Gas Manager at the Works.
By order,
JAMES MILLS,
Town Clerk.
Guildhall, Beverley,
April 11, 1893.

## BOROUGH OF WIDNES.

TO GASHOLDER MAKERS.

**THE Widnes Corporation are prepared** to receive TENDERS for a THREE-LIFT TELESCOPIC GASHOLDER, having a total capacity of 650,000 cubic feet.
Plans may be inspected, also Copies of Specification and Conditions of Contract obtained, on application to Isaac Carr, Assoc.M.Inst.C.E., Gas-Works, Widnes.
Tenders, endorsed "Gasholder," must be addressed to the Chairman of the Gas and Water Committee, and delivered to the undersigned at the Town Hall, Widnes, not later than Noon on Tuesday, May 2, 1893.
The Corporation do not bind themselves to accept the lowest or any tender.
H. S. OPPENHEIM,
Town Clerk.
Town Hall, Widnes,
April 13, 1893.

## COUNTY BOROUGH OF BURY.

TO SULPHURIC ACID MAKERS.

**THE Gas Committee of the Bury Cor-** poration are prepared to receive TENDERS for the supply of about 300 tons of SULPHURIC ACID for the manufacture of Sulphate of Ammonia, for a period of One Year, from the 1st of May, 1893.
Forms of Tender and Conditions may be obtained upon application to the undersigned.
Tenders must be endorsed "Tender for Sulphuric Acid," and be sent to J. Haslam, Esq., Town Clerk, Bury, on or before the 24th inst.
By order,
W. H. S. GENDALL,
Engineer and Manager.
Gas-Works, Elton, Bury,
April 10, 1893.

## INVERNESS CORPORATION GAS-WORKS.

**THE Inverness Gas Commissioners are** prepared to receive OFFERS for 6000 tons of GAS COAL, and 250 tons of SHELL LIME, to be delivered during the next Twelve Months as may be required. Intending offerers to state their price delivered free at Inverness Station or Harbour.
Tenders, endorsed "Tender for Coal" or "Lime," and addressed to Kenneth M'Donald, Esq., Clerk to the Commissioners, will be received up to Monday, the 1st of May.
Gas Office, Inverness,
April 10, 1893.

## ASHFORD, KENT.

**THE Directors of the Ashford Gas and** Coke Company, Limited, are prepared to receive TENDERS for the supply of 3000 tons of GAS COALS, to be delivered, at their Works at Ashford (Kent), in equal monthly quantities, from the 1st of July next to the 31st of March, 1894.
Tenders, specifying the description of Coals, the pits at which they are raised, and terms for net monthly payments, to be sent to me on or before Saturday, April 29, endorsed "Tender for Coal's."
F. HUGHES-HALLETT,
Secretary.
Ashford, April 8, 1893.

TENDERS FOR GAS COALS.

**THE Brentwood Gas and Coke Company** invite TENDERS for the supply of about 3000 tons of screened GAS COALS in Trucks at the Pit, or delivery at the Brentwood Railway Station (G.E.R.) in quantities as may be required, from the 8th day of May next to the 30th day of April, 1894.
Tenders (with analysis of the Coals to be supplied), and terms for cash payments, to be sent to the undersigned on or before the 29th inst.
The Directors do not bind themselves to accept the lowest or any tender.
C. A. FIELDER,
Secretary.
Brentwood, April 15, 1893.

## ULVERSTON LOCAL BOARD.

TENDERS FOR COAL AND CANNEL.

**THE Gas and Water Committee invite** TENDERS for the supply of best Screened GAS COAL or NUTS and CANNEL for One, Two, or Three Years, commencing the 1st of July next.
Parties tendering must give full particulars of the Coal and Cannel they propose to supply, and name the pit from which the same will be raised.
Further Information and Forms of Tender may be obtained on application to the undersigned.
Sealed tenders to be sent in not later than the 27th inst., addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal or Cannel."
The Committee do not bind themselves to accept the lowest or any tender.
JNO. SWAN,
Engineer and Manager.

## DUNFERMLINE GASLIGHT COMPANY, LIMITED.

**THE Directors invite Tenders for the** construction and erection of RETORT-BENCH MOUNTINGS, HYDRAULIC and FOUL MAINS, PURIFIERS, VALVES, CONNECTIONS, and LIME ELEVATOR, on their Premises at Grange Road, Dunfermline.
The Drawings and Specification may be seen at the Gas-Works, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.
Copies of the Bill of Quantities and Forms of Tender may be obtained from the latter on payment of Two Guineas, which will be returned if a *bonâ-fide* tender is sent in.
Sealed tenders, endorsed "Purifiers, &c., Contract No. 4," to be addressed to the Chairman, and sent, so as to reach this Office not later than Ten o'clock on Monday, the 1st of May, 1893.
The Directors do not bind themselves to accept the lowest or any tender.
JOHN MACKENZIE,
Assistant Manager.
Gas Offices, Dunferm'ine,
April 17, 1893.

## WALLASEY GAS-WORKS.

TO BUILDERS AND CONTRACTORS.

**THE Wallasey Local Board invite** TENDERS (one Contract) for the LEVELLING of LAND, DRAINAGE, Construction of BRANCH RAILWAY, Erection of RETORT and PURIFYING HOUSES, ALTERATION to OFFICES, and other WORK connected with New Gas-Works, at Poulton-cum-Seacombe, Cheshire.
Drawings and Specification may be inspected on application to the Engineer, Mr. H. Ashton Hill, Assoc. M.Inst. C.E., at the Gas and Water Works, Great Float, near Birkenhead.
Copy of Specification and Bill of Quantities, with Form of Tender, can be had on and after the 4th day of April, 1893, on payment of Five Guineas, to be returned on receipt of a *bonâ fide* tender.
Sealed tenders, on the form provided for the purpose, addressed to the Chairman of the Gas and Water Committee and endorsed "Tender for New Gas-Works," to be delivered at my Office, Church Street, Egremont, Cheshire, not later than Five o'clock p.m. on Monday, the 24th of April, 1893.
The Contractor will be required to enter into a bond with approved sureties, for the due performance of the contract, which contract and bond will be prepared at the expense of the Contractor.
The Board do not bind themselves to accept the lowest or any tender.
By order,
W. DANGER.
Public Offices, Egremont,
Cheshire, April 1, 1893.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on Tuesday, the 16th day of May next, at Three o'clock in the Afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor in the place of those retiring by rotation, and to transact the General Business of the Company.

The Transfer Books will be closed from the 2nd to the 16th of May next, both inclusive.

By order of the Board,
SAMUEL WOOD,
Secretary.

Offices: 30, Gracechurch Street,
London, April 18, 1893.

---

**ROBERT MARSHALL,**
**CANNEL COAL MERCHANT,**
**97, WELLINGTON STREET, GLASGOW.**

***Prices and Analysis of all the Scotch Cannels on application***

---

# LONDONDERRY GAS COALS

FROM THE

## MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

**S. J. DITCHFIELD,**
**SEAHAM HARBOUR, COUNTY OF DURHAM.**

---

NEW **BOX'S** PATENT

# RETORT-LID FASTENER.

**CANNOT GET OUT OF ORDER.**
**DOES NOT DAMAGE LIDS.**
**SIMPLE & EFFECTIVE.**
**CHEAP & DURABLE.**

*For Prices and Particulars, apply to*

**W. W. BOX,**
**GAS-WORKS, CRAYFORD, KENT.**

[*Illustrated Description in* JOURNAL, *Vol. LX., p.* 346.]

---

# BOLDON GAS COALS.

**Worked by THE HARTON COAL CO., LTD.,**
**Output about 3000 tons per day.**

ANALYSIS—

| | | |
|---|---|---|
| Yield of Gas per ton . . | 10,500 | Cubic Feet. |
| Illuminating Power . . | 16·9 | Candles. |
| Coke . . . . . | 66·7 | Coke. |
| Sulphur . . . . . | 0·86 | Sulphur. |
| Ash . . . . . | 2·04 | Ash. |

**Boldon Gas Coals are supplied under contract to**

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

**For prices, &c., apply to the**

**HARTON COAL COMPANY,**
LIMITED,
**Newcastle-on-Tyne.**
W. H. PARKINSON,
FITTER.

---

**NOTICE OF REMOVAL.**

TO GAS ENGINEERS & MANAGERS.

**CROWTHER BROS.,**

Contractors for Retort Setting, Erection of Gas Apparatus, and General Repairs, **have removed from 384, Mile End Road, to**

**152, TEVIOT ST., ST. LEONARD'S ROAD,**
**POPLAR, LONDON, E.**

---

**HOLMSIDE GAS COALS.**
**(Wrought out of Holmside and South Moor Collieries.)**

PRESENT production over 3200 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of over

**400,000 Tons per Annum.**

Full particulars on application to

**MR. MARK ARCHER,**
**HOLMSIDE AND SOUTH MOOR OFFICES,**
**NEWCASTLE-ON-TYNE.**

---

# AUG. KLÖNNE,

**DORTMUND** (GERMANY).

## REGENERATIVE FURNACES.

**Unsurpassed in Efficiency, Economy, Durability, and Easy Working.**

---

**Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for**

# CANNEL & COAL.

**TYNE BOGHEAD CANNEL.**

| | |
|---|---|
| Yield of Gas per ton . . . . . | 13,155 cub. ft. |
| Illuminating Power . . . . . | 38·22 candles. |
| Coke per ton . . . . . | 1,301·88 lbs. |

**EAST PONTOP GAS COAL.**

| | |
|---|---|
| Yield of Gas per ton . . . . . | 10,500 cub. ft. |
| Illuminating Power . . . . . | 16·3 candles. |
| Coke . . . . . | 70 per cent. |

**SOUTH PELAW MAIN GAS COAL.**

| | |
|---|---|
| Yield of Gas per ton . . . . . | 10,500 cub. ft. |
| Illuminating Power . . . . . | 16·3 candles. |
| Coke . . . . . | 73·1 per cent. |

*For Prices and complete Analysis, apply to*

**THOS. W. DANCE & SONS,**
COAL OWNERS, NEWCASTLE-ON-TYNE.
OR
**E. FOSTER & CO.,**
21, JOHN STREET, ADELPHI, LONDON, W.C.

---

**MEIKLEJOHN'S PATENT**

# Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.

Is cheap and easily fixed to any form of main.

Will be found the most efficient appliance of the kind yet introduced.

Further particulars and price from

**C. MEIKLEJOHN,**
**GAS-WORKS, RUGBY.**
(Late N. MEIKLEJOHN, Longwood.)

---

# NIDDRIE CANNEL

A FIRST-CLASS CANNEL COAL,

**Yielding a large volume of rich Gas, and fully 60 per cent. of first-class Coke.**

FOR ANALYSIS, PRICE, AND ALL OTHER PARTICULARS, APPLY TO

**The Niddrie & Benhar Coal Co., Ltd.,**
**4, York Buildings, Queen Street,**
EDINBURGH.
**Telegrams: "BENHAR, Edinburgh."**

---

# CAST-IRON PIPES

**FOR GAS AND WATER.**

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

# VALVES

**FOR GAS, WATER, AND STEAM.**

**TELEGRAMS: "PIPES GLASGOW."**

**WM. MACLEOD & CO.,**
**56, ROBERTSON STREET, GLASGOW.**

---

# THORNLEY GAS COALS

WORKED BY THE

**WEARDALE IRON AND COAL COMPANY, Ld.**

OUT OF THEIR

**THORNLEY AND WHEATLEY HILL COLLIERIES.**

The Analysis made by Messrs. J. and H. T. PATTINSON, Public Analyst for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a working Analysis made of these Coals by the Falmouth Gas Company:—

[COPY.]

FALMOUTH GAS COMPANY,
Offices: *Church Street, Falmouth,*
*January 25th*, 1893.

Messrs. the

**WEARDALE IRON & COAL COMPANY, LTD.,**
NEWCASTLE-ON-TYNE.

GENTLEMEN,

From the Cargo of **THORNLEY GAS COAL,** received early this month from you, I have Carbonized at these Works, during a period of thirteen consecutive days, 151$\frac{15}{20}$ tons of the Coal, mixed with 9$\frac{6}{20}$ tons of Cannel Shale (or about 6 per cent.)

The Make of Gas during the above period was 1,624,000 cubic feet.

The whole of the Gas was made from four beds of sixes (24 mouthpieces); each charge being of six hours' duration.

Gas made: 1,624,000 cubic feet.
Coal Carbonized: 151$\frac{15}{20}$ tons.
Cannel Shale: 9$\frac{6}{20}$ tons.
Make per ton of Coal and Cannel Carbonized: 10,082 cubic feet.
Coke per ton (of good quality): 13¼ cwt.

**The ILLUMINATING POWER** averages from 11 daily tests, **16·51 CANDLES,** which was ascertained by burning the Gas at the rate of 5 cubic feet per hour in a certified Letheby Photometer, fitted with a Standard Argand, each Candle consuming 120 grains of Sperm per hour.

Yours faithfully,
J. WM. BUCKLEY,
Engineer and Manager.

For Price, &c., apply to the

**WEARDALE IRON & COAL Co., Ld.,**
QUAYSIDE, NEWCASTLE-ON-TYNE.

**PRICE'S PATENT COKE & COAL BARROW**

effecting a great saving of time labour, and expense.

For particulars, price, &c., apply to Mr. E. Price, Inventor and Patentee, 22, Alwyne Road, Canonbury, London, N.

*Prices are Reduced.*

**NEWBATTLE CANNEL.**

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

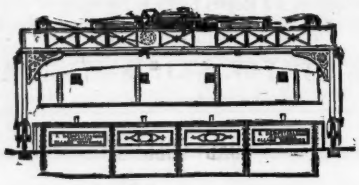
**THE LOTHIAN COAL COMPANY,**

LIMITED,

NEWBATTLE COLLIERIES,

**DALKEITH, N.B.**

**DEMPSTERS'**



**PURIFIERS** (MACHINED JOINTS)

**PURIFIERS.**

**ELLAND.**

**JAMES WHITE & CO., LTD.,**

WIDNES, LANCASHIRE,

Manufacturers of Special

**FIRE-BRICKS, FIRE-CLAY, & FURNACE CEMENT.**

FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the Market.

GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest Quality.

FURNACE CEMENT specially made for repairing Furnaces and stopping Cracks.

ANALYSIS AND REFERENCES ON APPLICATION.

# G. WALLER & CO.'S NEW PATENT GAS EXHAUSTER

**MADE WITH FOUR BLADES,**

To pass 300,000 Cubic Feet per Hour, with or without Engine combined.

IN USE AND ON ORDER FOR OVER 100 WORKS,

AND EQUAL TO

5,340,000 CUBIC FEET PER HOUR.

**SPECIAL ADVANTAGES:—**

The Four-Blade Exhauster **PASSES 50 PER CENT. MORE PER REVOLUTION** than any One or Two Blade Exhauster.
It takes 27 per cent. less power than any Two-Blade Exhauster.
It gives a steadier Gauge than any other Exhauster.
One of our 150,000 feet per hour Patent Four-Blade Exhausters passes continuously **180,000** cubic feet per hour, driven by a **12-INCH STEAM CYLINDER.** No other Maker can give a similar result.
Model of Patent Exhauster sent for inspection.
Oldest Makers of Beale Exhausters for over 300 Works.
Patent Compensating Steam Governor, Special Tar and Liquor Pumps, Gas-Valves.
Washer-Scrubbers, with **WOOD CLUSTERS**, and Tar Extractor combined.

**PHŒNIX ENGINEERING WORKS,**

**PARK STREET, SOUTHWARK, LONDON, S.E.**

**G. J. EVESON,**

GAS COAL AND CANNEL CONTRACTOR,

MANUFACTURER OF

**A Special Compound** for the cure of Stopped Ascension-Pipes. A couple of charges will clear a stopped Pipe, and an occasional charge keeps them clean; also increases the Make per ton and the Illuminating Power.

Prices and Particulars on Application. HEAD OFFICES: CORPORATION STREET, BIRMINGHAM. TELEGRAPHIC ADDRESS: "EVESON, BIRMINGHAM."

**THE WATERBLEAN COLOR AND MINING COMPANY, MILLOM, CUMBERLAND.**

TELEGRAPHIC ADDRESS: "WATERBLEAN MINES, MILLOM." PORTERAGE, 1s. 6d.

**VENETIAN AND OXIDE REDS for the Manufacture of ANTI-CORROSIVE PAINTS.**

Specially adapted for the Ironwork of Gas-Works and wherever subject to exposure.

**G. J. EVESON, Proprietor, Corporation Street, Birmingham.**

ORDERS TO BIRMINGHAM, OR DIRECT TO THE MINES.

**HANNA, DONALD, & WILSON,**

*(Established 1851),*

**GAS ENGINEERS & CONTRACTORS,**

Abercorn Foundry and Abbey Works,

**PAISLEY, N.B.,**

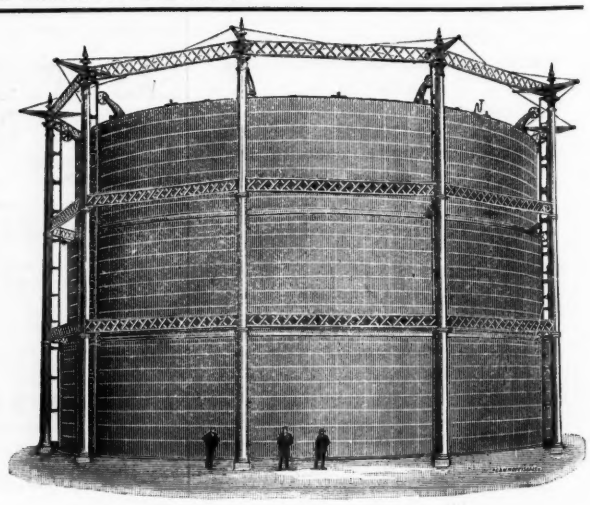
MAKERS OF

**Gasholders and Gas Plant**

**OF EVERY DESCRIPTION.**

Sole Agents for Scotland for the Automatic Coal-Gas Retort (Inclined System) Company, Limited.

**Telegraphic Address: "Donald Paisley."**



**TROTTER, HAINES, & CORBETT,**
**Brettell's Estate**
**FIRE-CLAY & BRICK WORKS,**
**STOURBRIDGE.**

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

**THE SILICA FIRE-BRICK COMPANY,**
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
**SILICA BLOCKS, BRICKS, AND CEMENT**
OF SUPERIOR QUALITY
**FOR GAS-FURNACES.**

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY
Strongly recommended where EXCESSIVE HEATS have to be maintained.

**UNEQUALLED.**
Gas Companies are solicited to try Samples of the
**MIRFIELD**
**BLACK BED GAS COAL.**
*Prices and Analysis on application.*
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

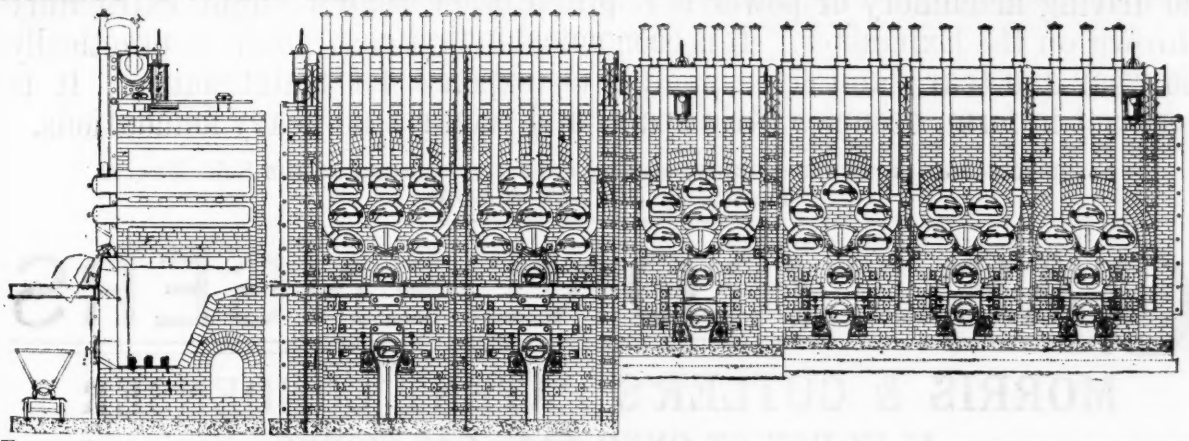
T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

**JAMES OAKES & Co.,**
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

**THOMAS TURTON AND SONS, LIMITED,**
Sheaf & Spring Works,
SHEFFIELD,
*MANUFACTURERS OF*
**FILES OF BEST QUALITY**
FOR ENGINEERS.
**STEEL OF ALL DESCRIPTIONS.**
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
*London Office:*
90, CANNON STREET, E.C.

**HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.**



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS, AND HAVE ALREADY BEEN EXTENSIVELY ADOPTED. THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS, AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES.

THE SETTINGS HAVE ATTAINED TO A MEASURE OF SUCCESS AND POPULARITY QUITE UNEQUALLED BY THAT OF ANY OTHER WITHIN THE SAME SPACE OF TIME. THE WORKING RESULTS OBTAINED, AND THE GENERAL SATISFACTION GIVEN, ARE DECLARED IN EVERY CASE TO EXCEED, AND IN MOST CASES CONSIDERABLY EXCEED, THE PATENTEE'S GUARANTEE. THE CONSTRUCTION AND WORKING OF THE PATENT PRODUCER AND THE PATENT CHARGING APPARATUS FOR SAME ARE ABSOLUTELY UNIQUE AND UNRIVALLED, AND ARE THE DELIGHT OF EVERY STOKER; WHILE IN EVERY OTHER PARTICULAR THEY SECURE THE HIGHEST RESULTS ATTAINABLE BY ANY REGENERATIVE SYSTEM, AND AT A MINIMUM OF COST.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings, or complete erection undertaken if required, and carried out by specially Trained Workmen.

**Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stewart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge, and from R. F. HISLOP (son of Patentee), Gas-Works, Paisley.**

**HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE** is a *Sine quâ non*
TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED, AND AFFORDING THE HIGHEST SATISFACTION.

**SPENT LIMES NO LONGER WASTE PRODUCTS**
**Under G. R. HISLOP'S PATENTS.**
All Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.
*Descriptive Pamphlets and Terms from Agents as above.*

# THE CHARLES HUNT GAS WASHER

## (HUNT'S PATENT).

By this Washer, which performs the functions of both a Washer and Scrubber, any tarry matters are intercepted, and the whole of the Ammonia is removed from the Gas, together with a high percentage of Carbonic Acid and Sulphuretted Hydrogen.

This is effected by causing the Gas to pass in finely-divided streams through a series of light seals, formed by inverted troughs, having their perforated sides submerged in liquid, and placed one above another. Clean Water, being introduced at the top and flowing from tier to tier in the opposite direction to the Gas, leaves the Washer at the bottom as strong Ammoniacal Liquor.

The lower tiers perform the function of a most efficient Tar Extractor, removing from the Gas all traces of tarry matters.

The total back pressure due to this apparatus does not exceed about 7 ins.

The advantages claimed for the Washer are: **It is entirely automatic in action**, depending only upon a constant supply of clean water, proportionate in quantity to the volume of Gas passing. **It has no moving parts**, and thus **no driving machinery or power** is required other than a slight extra duty thrown on the Exhauster. **It is economical in first cost**; there is **practically no wear and tear**; and consequently **no expense for maintenance. It is compact in form, occupies little space, and requires no heavy foundations.**

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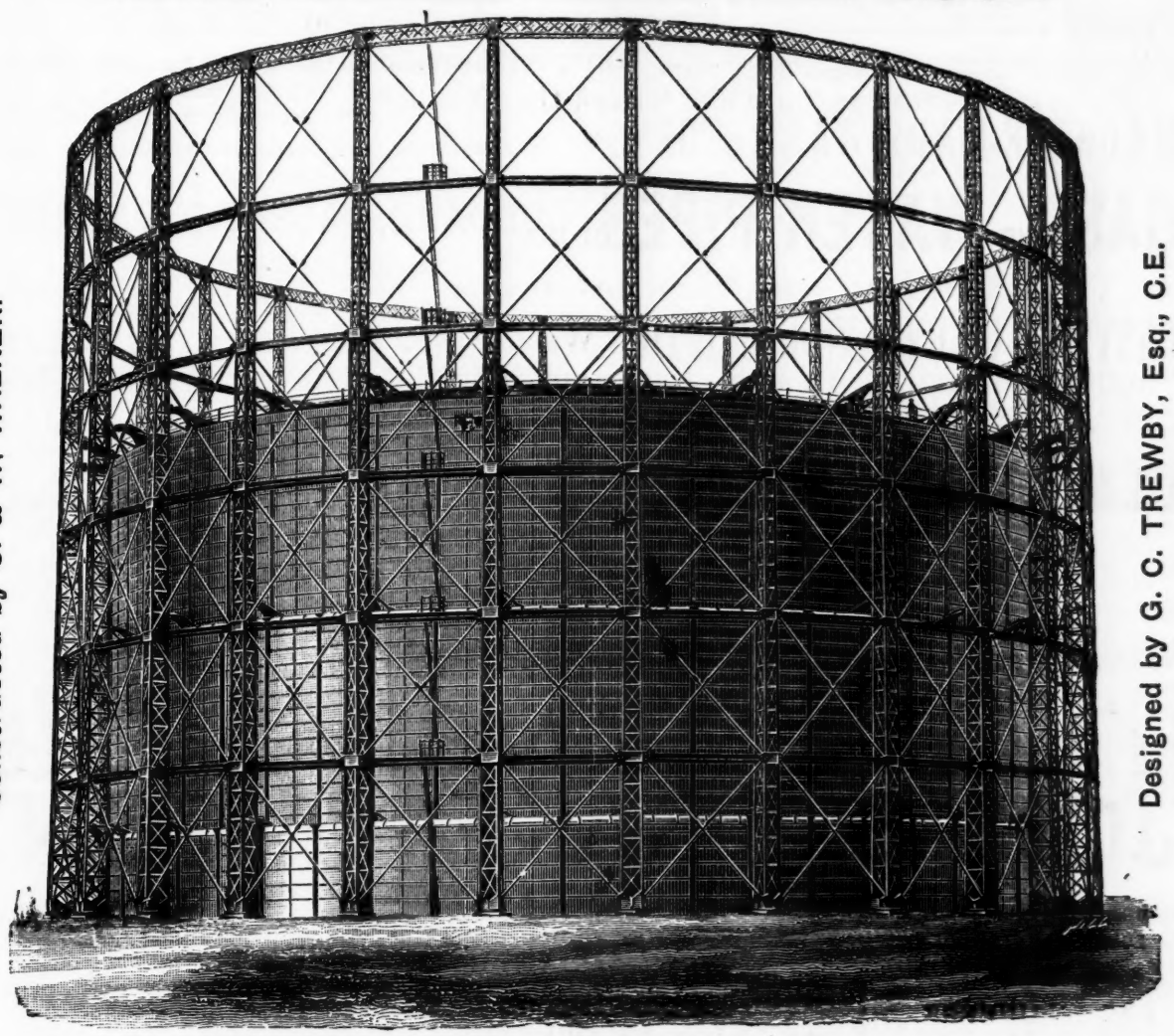

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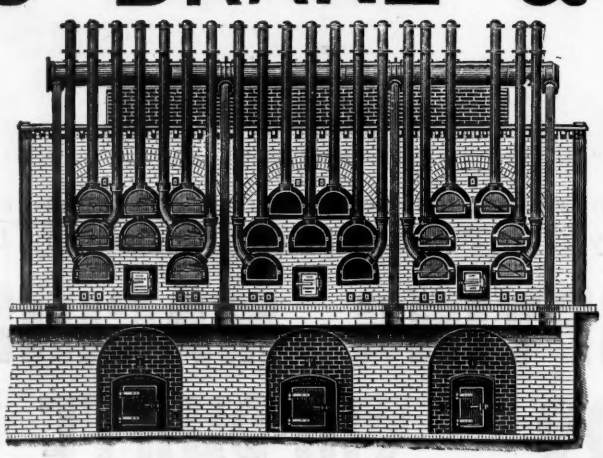

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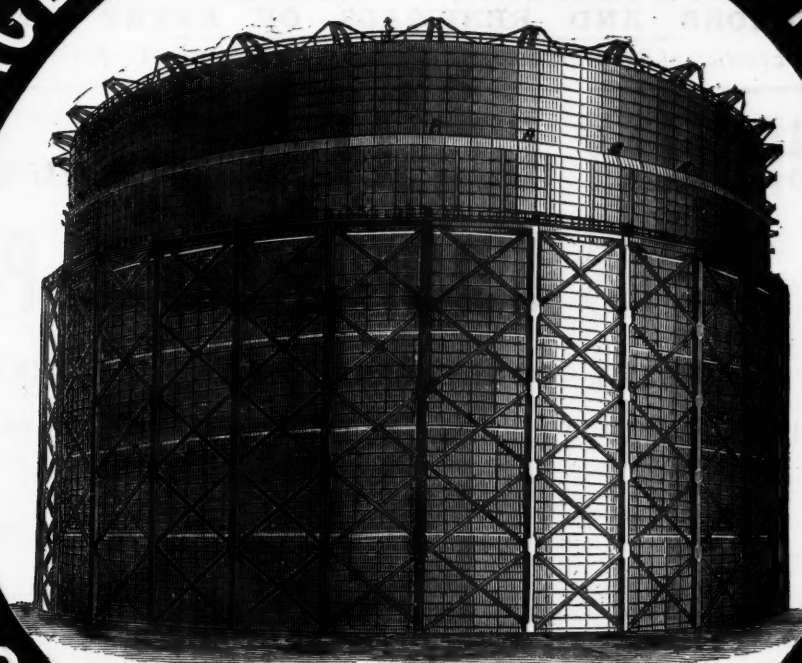

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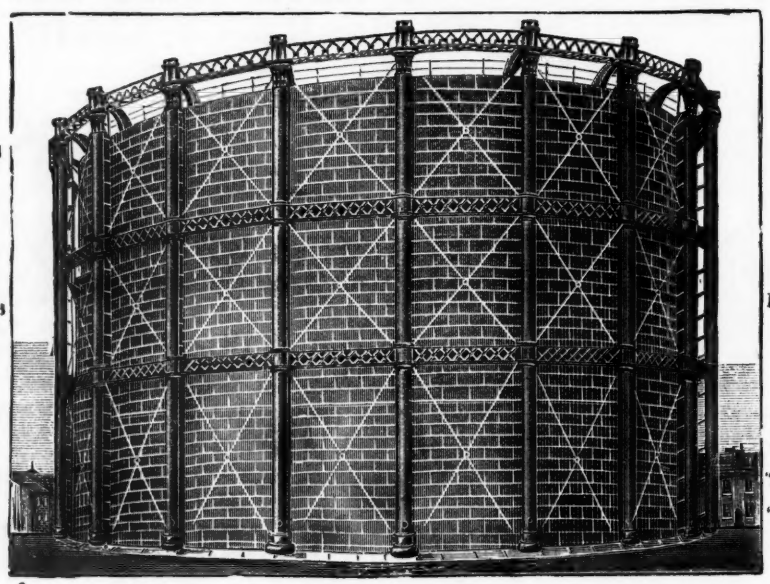

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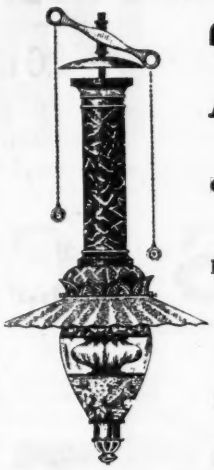

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[See also Advt., p. 672.


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